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ABSTRACT

As a supplement to the principal reports, a compilation of criterion check items and diagnostic test items identified by terminal objectives is presented in this document relating to the U. S. Naval Academy Self-Paced Physics Course. Included are a progress check item bank, student terminal objective key sheets, quarterly diagnostic tests and their answer keys, test item statistics for the Fall 1969 posttests, and pretests and posttests for the Fall 1969 volumes A through O. Skill ratings are provided for the progress check item. Multiple questions for each terminal objective are contained in the item bank. (Related documents are SE 016 065 - SE 016 088 and ED 062 123 - ED 062 125.) (CC)

ED 075258

Set #3

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# DOCUMENTATION REPORT

UNITED STATES NAVAL ACADEMY

Self-Paced
**PHYSICS**

This document is a supplement to the principal reports 5.10, 5.9, and 5.8, developed and produced under the U. S. Office of Education, Bureau of Research Project #8-0446, for the U. S. Naval Academy at Annapolis, Maryland. Contract #N00600-68C-0749.

## 5.3 TEST ITEM BANK

SE 016 087

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# DOCUMENTATION REPORT

## 5.3 TEST ITEM BANK

SECTION

A. PROGRESS CHECK ITEM BANK

B. STUDENT T.O. KEY SHEET (FIRST AND SECOND QUARTERLY DIAGNOSTIC TESTS)

ANSWER KEYS TO QUARTERLY DIAGNOSTIC TESTS

C. QUARTERLY DIAGNOSTIC TESTS

D. TEST ITEM STATISTICS FOR FALL, 1969 POST-TESTS

E. PRE-TEST AND POST-TESTS FOR FALL, 1969 VOLUMES A THROUGH O

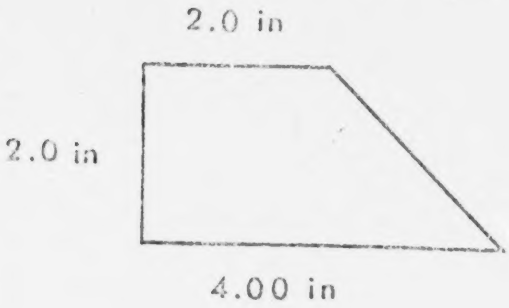
1-1.1 The dimensions of the figure shown were measured with different instruments. The area should be expressed in how many significant figures?

A. 1

B. 2

C. 4

D. 6



ID# 1-1.1

T.O.# 003-00

Skill Rating 0

Diagram? yes

Answer: B

================

USNA Accepts ____

Ques. Proofed____
Ques. Xeroxed____

Diagram Made____
Diagram OK ____
Diagram Xerox____

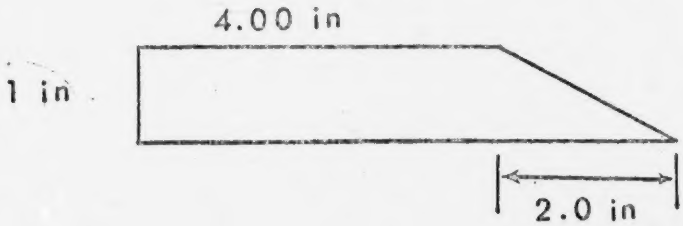
1-1.2 The dimensions of the figure shown were measured with different instruments. The area should be expressed in how many significant figures?

A. 1

B. 2

C. 3

D. 4



ID# 1-1.2

T.O.# 003-00

Skill Rating 0

Diagram? yes

Answer: A

================

USNA Accepts ____

Ques. Proofed____
Ques. Xeroxed

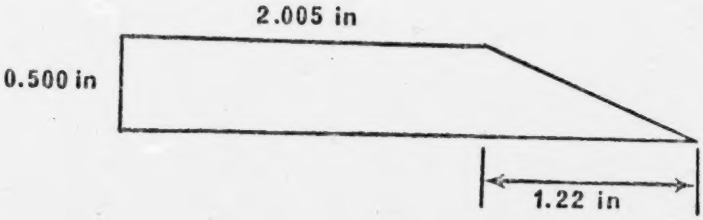
1-1.3 The dimensions of the figure shown were measured with different instruments. The area should be expressed in how many significant figures?

A. 2

B. 3

C. 4

D. 6



ID# 1-1.3

T.O.# 003-00

Skill Rating 0

Diagram? yes

Answer: B

================

USNA Accepts ____

Ques. Proofed____
Ques. Xeroxed____

Diagram Made

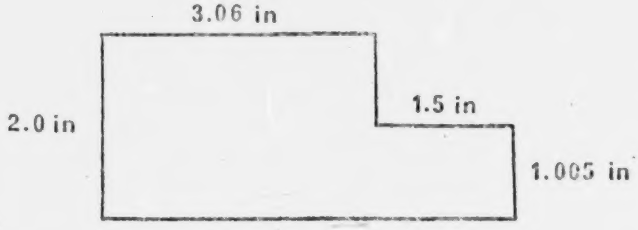
1-1.4 The dimensions of the figure shown were measured with different instruments. The area should be expressed in how many significant figures?

A. 2

B. 3

C. 4

D. 7



ID# 1-1.4
T.O.# 003-00
Skill Rating 0
Diagram? yes
Answer: A
================
USNA Accepts ____
Ques. Proofed ____

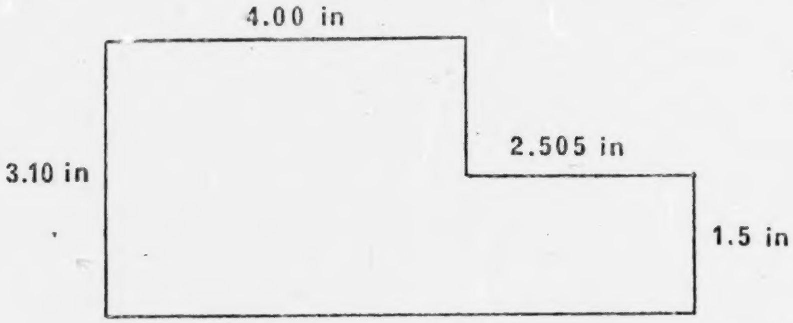
1-1.5 The dimensions of the figure shown were measured with different instruments. The area should be expressed in how many significant figures?

A. 2

B. 3

C. 5

D. 7



ID# 1-1.5
T.O.# 003-00
Skill Rating 0
Diagram? yes
Answer: A
================
USNA Accepts ____
Ques. Proofed ____

1-6.1 A plane travels 40 miles due north, then changes its course to a direction of 53° north of east and travels for 100 miles. Finally it travels 60 miles due west. Its total displacement is:

A. 200 miles

B. 170 miles at 45° north of east

C. 120 miles due north

D. 102 miles at 11.3° east of north

ID# 1-6.1
T.O.# 004-00
Skill Rating 2
Diagram? no
Answer: C
================
USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____

1-6.2 A plane travels 60 miles due south, then changes its course to a direction of 37° north of east and travels for 200 miles. Finally it travels 80 miles due west. Its total displacement is:

A. 340 miles

B. 200 miles at 37° north of east

C. 110 miles at 21.5° east of north

D. 100 miles at 37° north of east

ID# 1-6.2
T.O.# 004-00
Skill Rating 2
Diagram? no
Answer: D

=================
USNA Accepts ____

Ques. Proofed ____
Ques. Xeroxed ____

Diagram Made ____
Diagram OK ____
Diagram Xerox ____

1-6.3 A plane travels 50 miles due east, then changes its course to a direction of 30° north of west and travels for 100 miles. Finally it travels 30 miles due south. Its total displacement is:

A. 180 miles

B. 136.5 miles at 8.7° north of west

C. 56.6 miles due north

D. 41.7 miles at 28.7° north of west

ID# 1-6.3
T.O.# 004-00
Skill Rating 2
Diagram? no
Answer: D

=================
USNA Accepts

1-6.4 A plane travels due south for 50 miles, then changes its course to a direction of 45° north of west for 100 miles. Finally it travels 50 miles due east. Its total displacement is:

A. 242 miles at 45° north of west

B. 200 miles

C. 35.2 miles at 45° north of west

D. 29.3 miles at 45° north of west

ID# 1-6.4
T.O.# 004-00
Skill Rating 2
Diagram? no
Answer: D

=================
USNA Accepts ____

Ques. Proofed ____
Ques. Xeroxed ____

Diagram Made ____
Diagram OK ____

1-6.5 A plane travels due west for 100 miles, then changes its course to a direction of 37° north of east for 200 miles. Finally it travels 40 miles due south. Its total displacement is:

A. 340 miles

B. 120 miles at 9.5° east of north

C. 100 miles at 53° north of east

D. 100 miles at 37° north of east

ID# 1-6.5
T.O.# 004-00
Skill Rating 2
Diagram? no
Answer: C

USNA Accepts ____

Ques. Proofed____
Ques. Xeroxed____

Diagram Made____
Diagram OK ____
Diagram Xerox____

To NYIT ____
To Computer____
OK Computer____

Answer Record____

NYIT, Fall 1970

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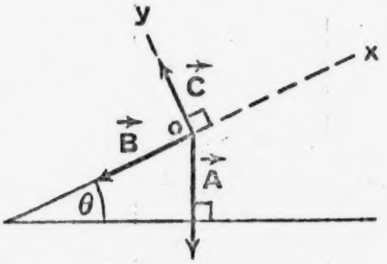
1-10.1 Find the components Rx and Ry of the vector $\vec{R}$, where vector $\vec{R}$ is the resultant (vector sum) of the vectors $\vec{A}$, $\vec{B}$ and $\vec{C}$. Use the coordinate system indicated.

A. $R_x = A \sin \theta$ $R_y = A \cos \theta$

B. $R_x = -B \cos \theta - C \sin \theta$ $R_y = C \cos \theta - A$

C. $R_x = - B - A \sin \theta$ $R_y = C - A \cos \theta$

D. $R_x = B - A \cos \theta$ $R_y = C - A \sin \theta$



ID# 1-10.1
T.O.# 014-21
Skill Rating 2
Diagram? yes
Answer: C

USNA Accepts ____

Ques. Proofed____
Ques. Xeroxed____

Diagram Made____
Diagram OK ____
Diagram Xerox____

To NYIT ____
To Computer____
OK Computer____

Answer Record____

NYIT, Fall 1970

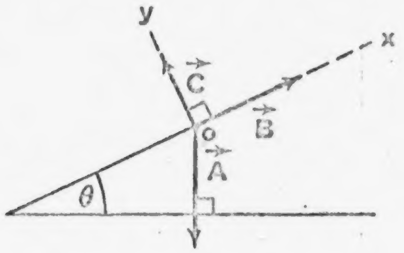
1-10.2 Find the components Rx and Ry of the vector $\vec{R}$, where vector $\vec{R}$ is the resultant (vector sum) of the vectors $\vec{A}$, $\vec{B}$ and $\vec{C}$. Use the coordinate system indicated.

A. $R_x = B \cos \theta$ $R_y = A - B \sin \theta$

B. $R_x = B + A \cos \theta$ $R_y = C + A \sin \theta$

C. $R_x = B - A \cos \theta$ $R_y = C - A \sin \theta$

D. $R_x = B - A \sin \theta$ $R_y = C - A \cos \theta$



ID# 1-10.2

T.O.# 014-21

Skill Rating 2

Diagram? yes

Answer: D

================

USNA Accepts ____

Ques. Proofed____
Ques. Xeroxed____

Diagram Made______
Diagram OK ______
Diagram Xerox____

To NYIT ________
To Computer______
OK Computer______

Answer Record____

NYIT, Fall 1970

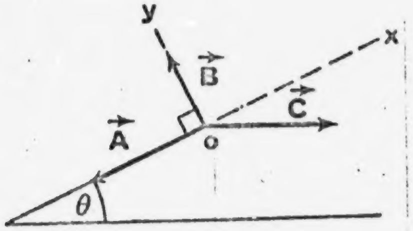
1-10.3 Find the components Rx and Ry of the vector $\vec{R}$, where vector $\vec{R}$ is the resultant (vector sum)of the vectors $\vec{A}$, $\vec{B}$ and $\vec{C}$. Use the coordinate system indicated.

A. $R_x = C \cos \theta - A$ $R_y = B - C \sin \theta$

B. $R_x = C - A \cos \theta$ $R_y = B \cos \theta - A \sin \theta$

C. $R_x = A + B \sin \theta$ $R_y = B + C \sin \theta$

D. $R_x = A - C \cos \theta$ $R_y = B$



ID# 1-10.3

T.O.# 014-21

Skill Rating 2

Diagram? yes

Answer: A

================

USNA Accepts ____

Ques. Proofed____
Ques. Xeroxed____

Diagram Made______
Diagram OK ______
Diagram Xerox____

To NYIT ________
To Computer______
OK Computer______

Answer Record____

NYIT, Fall 1970

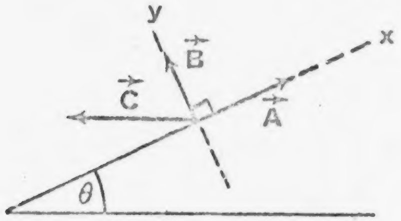
1-10.4 Find the components Rx and Ry of the vector $\vec{R}$, where vector $\vec{R}$ is the resultant (vector sum) of the vectors $\vec{A}$, $\vec{B}$ and $\vec{C}$. Use the coordinate system indicated.

A. $R_x = A \cos\theta - C$ $R_y = A \sin\theta + B \sin\theta$

B. $R_x = A \cos\theta$ $R_y = A \sin\theta$

C. $R_x = A - C \sin\theta$ $R_y = B - C \cos\theta$

D. $R_x = A - C \cos\theta$ $R_y = B + C \sin\theta$



ID# 1-10.4
T.O.# 014-21
Skill Rating 2
Diagram? yes
Answer: D

USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____
Diagram Made____
Diagram OK ____
Diagram Xerox____
To NYIT ____
To Computer____
OK Computer____
Answer Record____
NYIT, Fall 1970

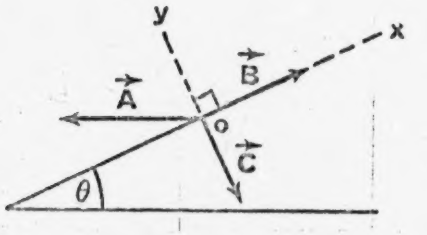
1-10.5 Find the components Rx and Ry of the vector $\vec{R}$, where vector $\vec{R}$ is the resultant (vector sum) of the vectors $\vec{A}$, $\vec{B}$ and $\vec{C}$. Use the coordinate system indicated.

A. $R_x = B + A \cos\theta$ $R_y = C + A \sin\theta$

B. $R_x = B - A \cos\theta$ $R_y = A \sin\theta - C$

C. $R_x = B \cos\theta - A$ $R_y = B \sin\theta - A \cos\theta$

D. $R_x = B - A \sin\theta$ $R_y = A \cos\theta - C$



ID# 1-10.5
T.O.# 014-21
Skill Rating 2
Diagram? yes
Answer: B

USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____
Diagram Made____
Diagram OK ____
Diagram Xerox____
To NYIT ____
To Computer____
OK Computer____
Answer Record____
NYIT, Fall 1970

1-13.1 A car moving at a constant rate R covers a distance D during a time interval T. Its rate can be expressed in

A. m-sec

B. sec per ft

C. mi-hr

D. ft/sec

ID# 1-13.1
T.O.# 005-00
Skill Rating 0
Diagram? no
Answer: D

================
USNA Accepts ____
Ques. Proofed

1-13.2 A car moving at a constant rate R covers a distance D during a time interval T. Its rate can be expressed in

A. mi-sec

B. sec per ft

C. mi per hr

D. hr/ft

ID# 1-13.2
T.O.# 005-00
Skill Rating 0
Diagram? no
Answer: C

================
USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____
Diagram Made____

1-13.3 A car moving at a constant rate R covers a distance D during a time interval T. Its rate can be expressed in

A. ft-min

B. mi-hr

C. ft/sec

D. hr/mi

ID# 1-13.3
T.O.# 005-00
Skill Rating 0
Diagram? no
Answer: C

================
USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____
Diagram Made____
Diagram OK ____
Diagram Xerox____

1-13.4 A car moving at a constant rate R covers a distance D during a time interval T. Its rate can be expressed in

A. mi/hr

B. ft-sec

C. yd-sec

D. min/ft

ID# 1-13.4

T.O # 005-00

Skill Rating 0

Diagram? no

Answer: A

================

USNA Accepts ____

Ques. Proofed ____
Ques Xeroxed ____

1-13.5 A car moving at a constant rate R covers a distance D during a time interval T. Its rate can be expressed in

A. ft-sec

B. ft per sec

C. sec/ft

D. mi-hr

ID# 1-13.5

T.O # 005-00

Skill Rating 0

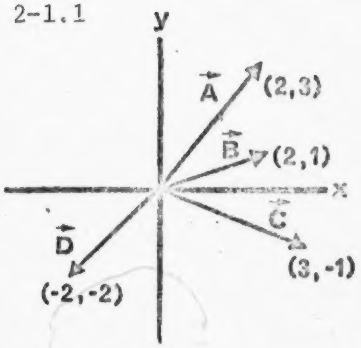
Diagram? no

Answer: B

================

USNA Accepts ____

2-1.1



Four vectors $\vec{A}$, $\vec{B}$, $\vec{C}$ and $\vec{D}$ are shown in the figure. The dot product $(\vec{A} + \vec{C}) \cdot (\vec{B} - \vec{D})$ is equal to:

A. 20
B. 26
C. 24
D. -6

ID# 2-1.1

T.O.# 004-00

Skill Rating 2

Diagram? yes

Answer: B

================

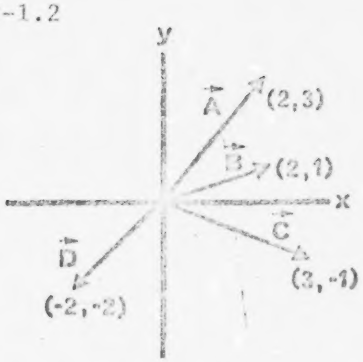
USNA Accepts ____

Ques. Proofed ____
Ques. Xeroxed ____

Diagram Made ____
Diagram OK ____
Diagram Xerox ____

To NYIT ____

2-1.2


y
x
$\vec{A}$
(2,3)
$\vec{B}$
(2,1)
$\vec{C}$
(3,-1)
$\vec{D}$
(-2,-2)

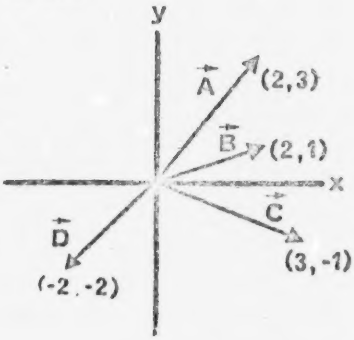
Four vectors $\vec{A}$, $\vec{B}$, $\vec{C}$ and $\vec{D}$ are shown in the figure. The dot product $(\vec{A} + \vec{D}) \cdot (\vec{B} - \vec{C})$ is equal to:

A. -6
B. 20
C. 2
D. 24

ID# 2-1.2
T.O.# 004-00
Skill Rating 2
Diagram? yes
Answer: C

================
USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____
Diagram Made

2-1.3


y
x
$\vec{A}$
(2,3)
$\vec{B}$
(2,1)
$\vec{C}$
(3,-1)
$\vec{D}$
(-2,-2)

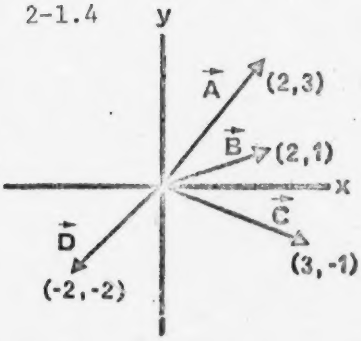
Four vectors $\vec{A}$, $\vec{B}$, $\vec{C}$ and $\vec{D}$ are shown in the figure. The dot product $(\vec{A} - \vec{D}) \cdot (\vec{B} + \vec{C})$ is equal to:

A. 20
B. 24
C. 14
D. -6

ID# 2-1.3
T.O.# 004-00
Skill Rating 2
Diagram? yes
Answer: A

================
USNA Accepts ____

2-1.4


y
x
$\vec{A}$
(2,3)
$\vec{B}$
(2,1)
$\vec{C}$
(3,-1)
$\vec{D}$
(-2,-2)

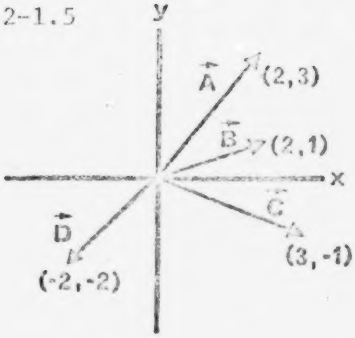
Four vectors $\vec{A}$, $\vec{B}$, $\vec{C}$ and $\vec{D}$ are shown in the figure. The dot product $(\vec{A} - \vec{B}) \cdot (\vec{C} + \vec{D})$ is equal to:

A. 2
B. -4
C. 24
D. -6

ID# 2-1.4
T.O.# 004-00
Skill Rating 2
Diagram? yes
Answer: D

================
USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____
Diagram Made_____
Diagram OK ______
Diagram Xerox____

2-1.5



Four vectors $\vec{A}$, $\vec{B}$, $\vec{C}$ and $\vec{D}$ are shown in the figure. The dot product $(\vec{A} - \vec{C})\cdot(\vec{B} + \vec{D})$ is equal to:

A. 2

B. -4

C. -6

D. 24

ID# 2-1.5

T.O # 004-00

Skill Rating 2

Diagram? yes

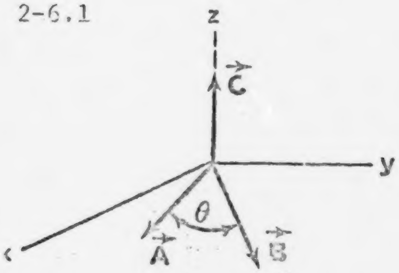
Answer: B

================

USNA Accepts ____

Ques. Proofed____
Ques. Xeroxed____
Diagram Made

2-6.1



The vectors $\vec{A}$ and $\vec{B}$ are in the xy - plane. The vector $\vec{C}$ lies along the positive z - axis. The magnitude of $\vec{A}$ is one unit and that of $\vec{B}$ and C is two units. The product $(\vec{B} \times \vec{C})\cdot \vec{A}$ is:

A. 4 sin θ

B. -4 sin θ

C. 4 cos θ

D. -4 cos θ

ID# 2-6.1

T.O # 004-00

Skill Rating 2

Diagram? yes

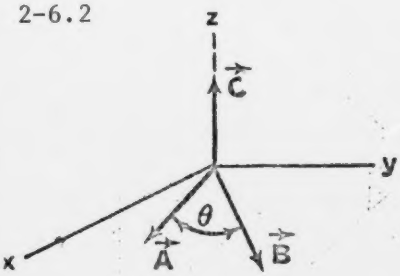
Answer: A

================

USNA Accepts ____

Ques. Proofed____

2-6.2



The vectors $\vec{A}$ and $\vec{B}$ are in the xy - plane. The vector $\vec{C}$ lies along the positive z - axis The magnitude of $\vec{A}$ is one unit and that of $\vec{B}$ and $\vec{C}$ is two units. The product $(\vec{B} \times \vec{A})\cdot \vec{C}$ is:

A. 4 sin θ

B. -4 cos θ

C. 4 cos θ

D. -4 sin θ

ID# 2-6.2

T.O # 004-00

Skill Rating 2

Diagram? yes

Answer: A

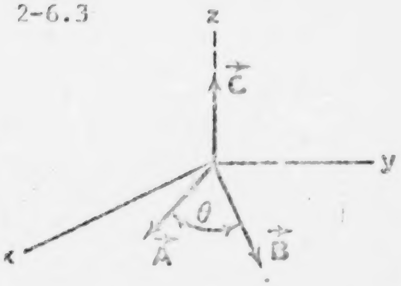
================

USNA Accepts ____

Ques. Proofed____
Ques. Xeroxed____

Diagram Made_____
Diagram OK ______
Diagram Xerox_____

2-6.3



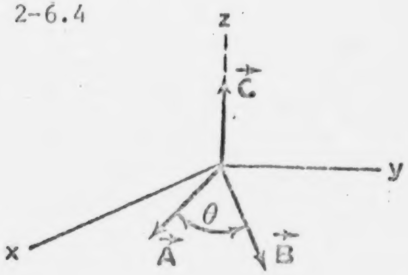
The vectors $\vec{A}$ and $\vec{B}$ are in the xy - plane. The vector $\vec{C}$ lies along the positive z - axis. The magnitude of $\vec{A}$ is one unit and that of $\vec{B}$ and $\vec{C}$ is two units. The product $(\vec{C} \times \vec{B}) \cdot \vec{A}$ is:

A. $-4 \cos \theta$
B. $4 \cos \theta$
C. $-4 \sin \theta$
D. $4 \sin \theta$

ID# 2-6.3
T.O # 004-00
Skill Rating 2
Diagram? yes
Answer: C

=================
USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed

2-6.4



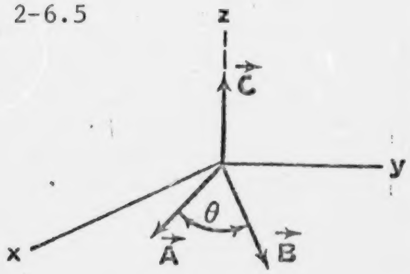
The vectors $\vec{A}$ and $\vec{B}$ are in the xy - plane. The vector $\vec{C}$ lies along the positive z - axis The magnitude of $\vec{A}$ is one unit and that of $\vec{B}$ and $\vec{C}$ is two units. The product $(\vec{C} \times \vec{A}) \cdot \vec{B}$ is:

A. $4 \sin \theta$
B. $-4 \sin \theta$
C. $4 \cos \theta$
D. $-4 \cos \theta$

ID# 2-6.4
T.O # 004-00
Skill Rating 2
Diagram? yes
Answer: A

=================
USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____
Diagram Made

2-6.5



The vectors $\vec{A}$ and $\vec{B}$ are in the xy - plane. The vector $\vec{C}$ lies along the positive z - axis The magnitude of $\vec{A}$ is one unit and that of $\vec{B}$ and $\vec{C}$ is two units. The product $(\vec{A} \times \vec{C}) \cdot \vec{B}$ is:

A. $4 \sin \theta$
B. $-4 \sin \theta$
C. $-4 \cos \theta$
D. $4 \cos \theta$

ID# 2-6.5
T.O # 004-00
Skill Rating 2
Diagram? yes
Answer: B

=================
USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____
Diagram Made____
Diagram OK ____
Diagram Xerox____

2-10.1 A student drives in a direction 60° north of east at 40 mi/hr for two hours, then due east at 60 mi/hr for one hour and then 60° south of east at 80 mi/hr for one hour. His average velocity ($\vec{\bar{v}}$) and average speed $\bar{v}$ over the entire journey are:

A. 35 mi/hr, 60 mi/hr

B. 35 mi/hr, 55 mi/hr

C. 55 mi/hr, 45 mi/hr

D. 45 mi/hr, 60 mi/hr

ID# 2-10.1

T.O.# 004-00

Skill Rating 2

Diagram? no

Answer: B

================

USNA Accepts ____

Ques. Proofed TO

Ques. Xeroxed____

Diagram Made_____

2-10.2 A student drives due north at 60 mi/hr for two hours, then due south at 60 mi/hr for one hour and then due east at 40 mi/hr for two hours. His average velocity ($\vec{\bar{v}}$) and average speed ($\bar{v}$) over the entire journey are:

A. 53.3 mi/hr, 64 mi/hr

B. 20 mi/hr, 50 mi/hr

C. 20 mi/hr, 52 mi/hr

D. 50 mi/hr, 53.3 mi/hr

ID# 2-10.2

T.O.# 004-00

Skill Rating 2

Diagram? no

Answer: C

================

USNA Accepts ____

2-10.3 The quarter-back took the snap from center at the 50-yard line. He faded back perpendicular to the line of scrimmage at 15 ft/sec for two seconds, then ran parallel to the line of scrimmage at 20 ft/sec for two seconds, then ran downfield at 30 ft/sec for two seconds and was there tackled by the left line-backer. His average velocity ($\vec{\bar{v}}$) and average speed ($\bar{v}$) during the play were:

A. $21\frac{2}{3}$ ft/sec, $8\frac{1}{3}$ ft/sec

B. 5 ft/sec, $21\frac{2}{3}$ ft/sec

C. $21\frac{2}{3}$ ft/sec, 5 ft/sec

D. $8\frac{1}{3}$ ft/sec, $21\frac{2}{3}$ ft/sec

ID# 2-10.3

T.O.# 004-00

Skill Rating 2

Diagram? no

Answer: D

================

USNA Accepts ____

Ques. Proofed TO

Ques. Xeroxed____

Diagram Made_____

Diagram OK _____

Diagram Xerox____

To NYIT

2-10.4 A student drives his car from the Academy, 30 miles to Baltimore in 45 minutes, then 50 miles to Washington, D.C. in one hour and 15 minutes and then 40 miles back to the Academy in one hour. His average velocity ($\vec{v}$) and average speed ($\bar{v}$) over the entire journey are:

A. 0, 40 mi/hr

B. 40 mi/hr, 40 mi/hr

C. 40 mi/hr, 0

D. 0, 0

ID# 2-10.4
T.O.# 004-00
Skill Rating 2
Diagram? no
Answer: A

USNA Accepts ____
Ques. Proofed Td

2-10.5 A student walks due east at 6 ft/sec for 10 seconds, then 30° west of north at 5 ft/sec for 24 seconds and then 30° west of south for 120 feet in 26 seconds. The magnitude of his average velocity ($\vec{v}$) and average speed ($\bar{v}$) over the entire trip are:

A. 5.21 ft/sec, 5 ft/sec

B. 1 ft/sec, 5 ft/sec

C. 5 ft/sec, 5.21 ft/sec

D. 5 ft/sec, 1 ft/sec

ID# 2-10.5
T.O.# 004-00
Skill Rating 2
Diagram? no
Answer: B

USNA Accepts ____
Ques. Proofed SN
Oues. Xeroxed

2-14.1 The position of a particle moving in one dimension is given by the equation

$$x = 3 + 2t + t^2 - 2t^3$$

where x is in meters when t is in seconds. What is the particle's velocity when t = 2 sec?

v = __________

ID# 2-14.1
T.O.# 011-00
Skill Rating 2
Diagram? no
Answer: -6 m/sec

USNA Accepts ____
Ques. Proofed Td
Ques. Xeroxed____

Diagram Made_____
Diagram OK _____
Diagram Xerox_____

To NYIT

2-14.2 The position of a particle moving in one dimension is given by

$$x = a + bt$$

where a and b are constants. Given that the particle's position changes from x = 4m at t = 2 sec to x = 25m at t = 5 sec, what is the magnitude of the particle's velocity in m/sec at t = 4 sec?

v = ____________

ID# 2-14.2

T.O.# 011-00

Skill Rating 2

Diagram? no

Answer: 7 m/sec

=================

USNA Accepts ____

Ques. Proofed ____

Ques. Xeroxed ____

Diagram Made ____

2-14.3 The position of a particle moving in one dimension is described by the equation

$$x = a + t + bt^2$$

where a and b are constants. Given that the velocity is 9 m/sec when t = 2 sec, what is the magnitude of the constant b?

b = ____________

ID# 2-14.3

T.O.# 011-00

Skill Rating 2

Diagram? no

Answer: 2

=================

USNA Accepts ____

Ques. Proofed ____

Ques. Xeroxed ____

2-14.4 The displacement of a particle moving in one dimension is given by the equation

$$x = 5 + 10t + \frac{13}{2}t^2 - t^3$$

where x is in meters when t is in seconds. For what positive value of t is the velocity of the particle zero?

t = ____________

ID# 2-14.4

T.O.# 011-00

Skill Rating 2

Diagram? no

Answer: 5 sec

=================

USNA Accepts ____

Ques. Proofed ____

Ques. Xeroxed ____

Diagram Made ____

Diagram OK ____

2-14.5 The displacement of a particle moving in one dimension is given by the equation

$$x = 16t - t^3$$

where x is in meters when t is in seconds. What is the displacement x when the velocity of the particle is 4 m/sec?

$x =$ ________

ID# 2-14.5
T.O.# 011-00
Skill Rating 2
Diagram? no
Answer: 24m

2-17.1 The compass of an airplane indicates that it is headed due north, and its airspeed indicator shows that it is moving through the air at 120 mi/hr. If there is a wind of 50 mi/hr. from west to east, what is the velocity of the aircraft relative to the earth?

$\vec{V}_{ae} =$ ________

ID# 2-17.1
T.O.# 010-00
Skill Rating 1
Diagram? no
Answer: ________
130 mi/hr
22.5° east of north

2-17.2 A pilot wishes to travel due north. His airspeed is 120 mi/hr and the wind is blowing from west to east at 50 mi/hr. What direction must the pilot head his aircraft in order to travel due north?

________

ID# 2-17.2
T.O.# 010-00
Skill Rating 1
Diagram? no
Answer: ________
24.5° west of north

2-17.3 In order to cross a stream flowing at 6 mi/hr in a boat that travels 10 mi/hr, at what angle upstream should the boat be headed in order to reach the point directly opposite the starting point? What is the speed of the boat relative to the ground?

________ , ________

ID# 2-17.3
T.O.# 010-00
Skill Rating 2
Diagram? no
Answer: 36.9°
8 mi/hr

================
USNA Accepts ____
Ques. Proofed Td

2-17.4 A man can row a boat 4.0 mi/hr in still water. If he is crossing a river, which is 4.0 mi wide, and has a current of 2.0 mi/hr, how long will it take him to cross the river to a point directly opposite his starting point?

t = ________

ID# 2-17.4
T.O.# 010-00
Skill Rating 2
Diagram? no
Answer: 1.16 hr.
(range: 1.12 hr.
to 1.20 hr.

================
USNA Accepts ____
Ques. Proofed Td

2-17.5 A man can row a boat 4.0 mi/hr in still water. If the current in a river is 2.0 mi/hr, how long will it take him to row 2.0 mi downstream and then back to his starting point?

t = ________

ID# 2-17.5
T.O.# 010-00
Skill Rating 2
Diagram? no
Answer: 1.33 hr.
(range: 1.30 hr
to 1.36 hr.

================
USNA Accepts ____
Ques. Proofed Td
Ques. Xeroxed ____

3-1.1 A rocket is launched vertically upward from rest with a constant resultant acceleration of 96 ft/sec$^2$. Five seconds (5 sec) after lift-off its engine stops. What is the highest altitude it reaches?

A. 1200 ft.
B. 2400 ft.
C. 3600 ft.
D. 4800 ft.
E. 6000 ft.

ID# 3-1.1
009-02
T.O.# 009-03
Skill Rating 2
Diagram? no
Answer: D

================
USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT

3-1.2 A rocket is launched vertically upward from rest with a constant resultant acceleration of 64 ft/sec$^2$. Ten seconds (10 sec) after lift-off its engine stops. What is the highest altitude it reaches?

A. 1,600 ft.
B. 3,200 ft.
C. 4,800 ft.
D. 9,600 ft.
E. 11,200 ft.

ID# 3-1.2
009-02
T.O.# 009-03
Skill Rating 2
Diagram? no
Answer: D
================
USNA Accepts ____
Ques. Proofed

3-1.3 A sled moves from rest along a straight horizontal track with a constant acceleration of 10 ft/sec$^2$. At the end of ten seconds (10 sec) its engine cuts off and it comes to rest with a constant deceleration of 4 ft/sec$^2$. What is the total distance traveled by the sled?

A. 1,750 ft.
B. 875 ft.
C. 500 ft.
D. 1,000 ft.
E. 1,250 ft.

ID# 3-1.3
009-02
T.O.# 009-03
Skill Rating 2
Diagram? no
Answer: A
================
USNA Accepts

3-1.4 A sled moves from rest along a straight horizontal track with a constant acceleration of 20 ft/sec$^2$. At the end of ten seconds (10 sec) its engine cuts off and it comes to rest with a constant deceleration of 5 ft/sec$^2$. What is the total distance traveled by the sled?

A. 2,500 ft.
B. 4,000 ft.
C. 5,000 ft.
D. 1,000 ft.
E. 1,250 ft.

ID# 3-1.4
009-02
T.O.# 009-03
Skill Rating 2
Diagram? no
Answer: C
================
USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____
Diagram Made_____
Diagram OK _____
Diagram Xerox_____
To NYIT ________
To Computer______
OK Computer______

3-1.5 A ball falls freely from rest air into water, entering the water at the end of two seconds (2 sec). In the water its upward acceleration is 5 ft/sec$^2$. What distance does the ball travel from its starting point to the lowest point it reaches in the water?

A. 474 ft.
B. 237 ft.
C. 948 ft.
D. 410 ft.
E. 64 ft.

ID# 3-1.5
009-02
T.O.# 009-03
Skill Rating 2
Diagram? no
Answer: A

================

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

3-6.1 A stone is thrown vertically upward from a point 5.0 ft. above the ground. Two (2) seconds later it strikes the ground directly beneath its starting point. What is the maximum height above the ground reached by the stone?

A. 32.3 ft.
B. 16.2 ft.
C. 24.4 ft.
D. 18.7 ft.
E. 20.0 ft.

ELIMINATED BY USNA FROM PROGRESS
CHECK TESTING BANK ----
"too much algebra and lesser
degree of physics"

ID# 3-6.1
T.O.# 009-00
Skill Rating 2
Diagram? no
Answer: D

================

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

3-6.2 A boy throws a ball vertically upward from a window. As the ball leaves his hand, it is ten feet (10 ft) above the ground. Five seconds (5 sec) later it strikes the ground. What is the highest point above the ground reached by the ball?

A. 50 ft.
B. 75 ft.
C. 105 ft.
D. 155 ft.
E. 200 ft.

ELIMINATED FROM PROGRESS CHECK TESTING BANK BY USNA ---

"too much algebra and lesser degree of physics"

ID# 3-6.2
T.O.# 009-00
Skill Rating 2
Diagram? no
Answer: C

================
USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

3-6.3 A projectile is thrown from a platform ten feet (10 ft) above the ground. Four seconds (4 sec) later it strikes the ground. What is the highest point above the ground reached by the ball?

A. 34 ft.
B. 67 ft.
C. 134 ft.
D. 52 ft.
E. 49 ft.

ELIMINATED FROM PROGRESS CHECK TESTING BANK BY USNA -----

"too much algebra and lesser degree of physics"

ID# 3-6.3
T.O.# 009-00
Skill Rating 2
Diagram? no
Answer: B

================
USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

3-6.4 A projectile is fired from a platform sixteen feet (16 ft) above the ground. Four seconds (4 sec) later it strikes the ground. What is the highest point above the ground reached by the projectile?

A. 32 ft.
B. 72 ft.
C. 96 ft.
D. 122 ft.
E. 138 ft.

ELIMINATED FROM PROGRESS CHECK TESTING BANK BY USNA ---
"too much algebra and lesser degree of physics"

ID# 3-6.4
T.O.# 009-00
Skill Rating 2
Diagram? no
Answer: B

==================

USNA Accepts ____

Ques. Proofed ____
Ques. Xeroxed ____

Diagram Made ____
Diagram OK ____
Diagram Xerox ____

To NYIT ____
To Computer ____
OK Computer ____

Answer Record ____

NYIT, Fall 1970

3-6.5 A projectile is fired from a point sixteen feet (16 ft) below ground level. Eight seconds (8 sec) later it lands on the ground. What is the highest point above the ground reached by the projectile?

A. 66 ft.
B. 132 ft.
C. 198 ft.
D. 264 ft.
E. 528 ft.

ELIMINATED FROM PROGRESS CHECK TESTING BANK BY USNA ---
"too much algebra and lesser degree of physics"

ID# 3-6.5
T.O.# 009-00
Skill Rating 2
Diagram? no
Answer: D

==================

USNA Accepts ____

Ques. Proofed ____
Ques. Xeroxed ____

Diagram Made ____
Diagram OK ____
Diagram Xerox ____

To NYIT ____
To Computer ____
OK Computer ____

Answer Record ____

NYIT, Fall 1970

3-9.1

The distance from A to B is 4000 ft. A car accelerates at 10 $ft/sec^2$ from rest at A and then decelerates at 30 $ft/sec^2$ to come to rest at B. Assume that the change from acceleration to deceleration is instantaneous. At what distance from B does the deceleration begin?

A. 1000 ft.
B. 500 ft.
C. 750 ft.
D. 2000 ft.
E. 1500 ft.

ID# 3-9.1
T.O. # 009-00
Skill Rating 2
Diagram? yes
Answer: A

==============
USNA Accepts ___
Ques. Proofed___
Ques Xeroxed___
Diagram Made___
Diagram OK ___
Diagram Xerox

3-9.2

The distance from A to B is 3000 ft. A body accelerates from rest at A at 15 $ft/sec^2$ and then decelerates at 45 $ft/sec^2$ to stop at B. At what distance from B must the deceleration begin?

A. 1500 ft.
B. 1000 ft.
C. 750 ft.
D. 2000 ft.
E. 2250 ft.

ID# 3-9.2
T.O. # 009-00
Skill Rating 2
Diagram? yes
Answer: C

==============
USNA Accepts ___

3-9.3

The distance from A to B is 2200 ft. A body accelerates from rest at A at 10 $ft/sec^2$ and then decelerates at 40 $ft/sec^2$ to come to rest at B. At what distance from B does the deceleration begin?

A. 1,760 ft.
B. 1,000 ft.
C. 1,100 ft.
D. 880 ft.
E. 440 ft.

ID# 3-9.3
T.O. # 009-00
Skill Rating 2
Diagram? yes
Answer: E

==============
USNA Accepts ___
Ques. Proofed___
Ques. Xeroxed___
Diagram Made___
Diagram OK ___
Diagram Xerox

3-9.4

The distance from A to B is 3000 ft. A sled accelerates from rest at A at 15 $ft/sec^2$, and then decelerates at 30 $ft/sec^2$ to come to rest at B. At what distance from A does the deceleration begin?

A. 1,000 ft.
B. 1,500 ft.
C. 2,000 ft.
D. 2,500 ft.
E. 2,750 ft.

ID# 3-9.4
T.O.# 009-00
Skill Rating 2
Diagram? yes
Answer: C

================

USNA Accepts ____
Ques. Proofed____
Ques Xeroxed____
Diagram Made____
Diagram OK ____
Diagram Xerox____
To NYIT ____
To Computer____
OK Computer____
Answer Record____
NYIT, Fall 1970

3-9.5

The distance from A to B is 2400 ft. A sled accelerates at 10 $ft/sec^2$ from rest at A, and thendecelerates at 30 $ft/sec^2$ to come to rest at B. At what distance from A does the deceleration begin?

A. 300 ft.
B. 600 ft.
C. 1200 ft.
D. 1800 ft.
E. 2100 ft.

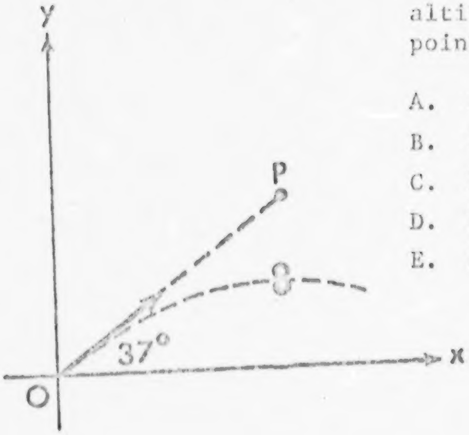
ID# 3-9.5
T.O.# 009-00
Skill Rating 2
Diagram? yes
Answer: D

================

USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____
Diagram Made____
Diagram OK ____
Diagram Xerox____
To NYIT ____
To Computer____
OK Computer____
Answer Record____
NYIT, Fall 1970

3-12.1

A ball is shot from the origin with an initial velocity of 20 m/sec at 37° above the horizontal. At the same instant, a second ball is released from the point P shown in the figure. The balls collide in mid-air at the end of one second (1 sec). What is the altitude of point P? [Consider the balls as point particles]



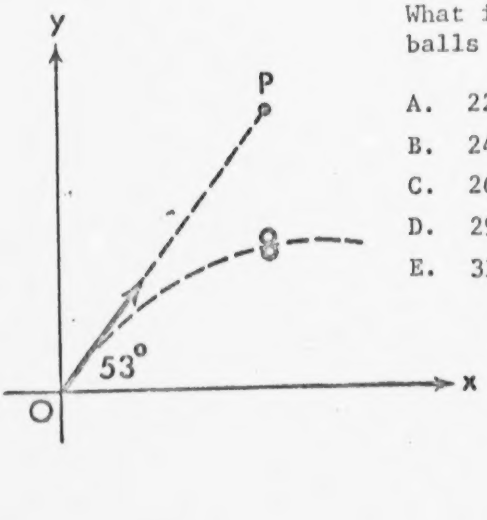
A. 12 m.
B. 14 m.
C. 16 m.
D. 18 m.
E. 20 m.

ID# 3-12.1
T.O.# 012-00
Skill Rating 2
Diagram? yes
Answer: A

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

3-12.2

A ball is shot from the origin with an initial velocity of 24.5 m/sec at 53° above the horizontal. At the same instant, a ball is dropped from the point P shown in the sketch. The balls collide in mid-air after 1.5 sec. What is the altitude of P? [Consider the balls as point particles.]



A. 22.1 m
B. 24.1 m
C. 26.4 m
D. 29.4 m
E. 31.2 m

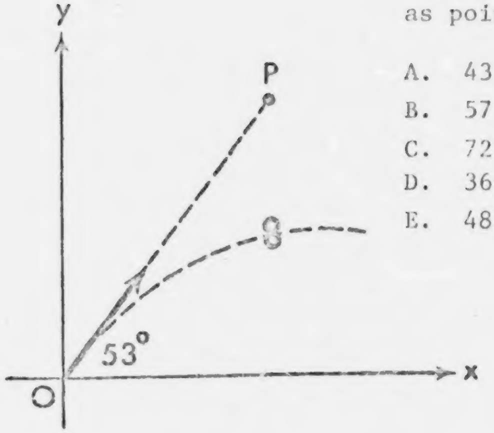
ID# 3-12.2
T.O.# 012-00
Skill Rating 2
Diagram? yes
Answer: D

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

3-12.3

A ball is shot from the origin with an initial velocity of 36 m/sec at an angle of 53° with the horizontal. At the same instant, a second ball is released from a point P. After two seconds (2 sec) the balls collide in mid-air. What is the altitude of the point P? [Consider the balls as point particles.]

A. 43.2 m
B. 57.6 m
C. 72.0 m
D. 36.0 m
E. 48.7 m



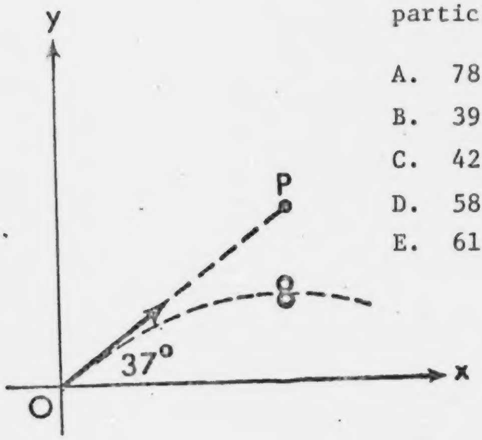
ID# 3-12.3
T.O # 012-00
Skill Rating 2
Diagram? yes
Answer: B

=================
USNA Accepts ____
Ques. Proofed____
Ques Xeroxed____
Diagram Made____
Diagram OK ____
Diagram Xerox____
To NYIT ____
To Computer____
OK Computer____
Answer Record____
NYIT, Fall 1970

3-12.4

A ball is shot from the orgin with an initial velocity of 49 m/sec at 37° above the horizontal. At the same instant, a second ball is released from the point P shown in the figure. The balls collide in mid-air after two seconds (2 sec) What is the altitude of the point P? [Consider the balls as point particles]

A. 78.4 m
B. 39.2 m
C. 42.3 m
D. 58.8 m
E. 61.3 m

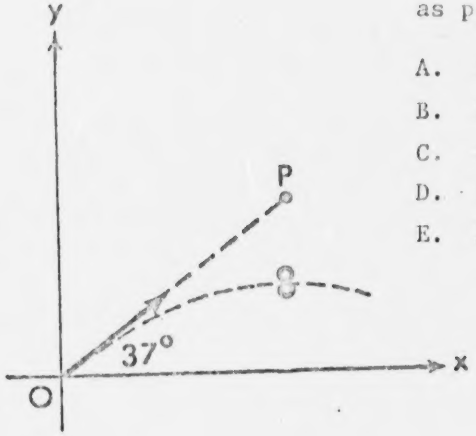


ID# 3-12.4
T.O # 012-00
Skill Rating 2
Diagram? yes
Answer: D

=================
USNA Accepts ____
Ques. Proofed____
Ques Xeroxed____
Diagram Made____
Diagram OK ____
Diagram Xerox____
To NYIT ____
To Computer____
OK Computer____
Answer Record____
NYIT, Fall 1970

3-12.5

A ball is shot from the orgin with an initial velocity of 24.5 m/sec at an angle of 37° above the horizontal. At the same instant, a second ball is dropped from the point P shown in the figure. At the end of one second (1 sec) the balls collide in mid-air. What is the altitude of P? [Consider the balls as point particles.]



A. 23.2 m

B. 21.5 m

C. 29.4 m

D. 19.6 m

E. 14.7 m

ID# 3-12.5
T.O # 012-00
Skill Rating 2
Diagram? yes
Answer: E

USNA Accepts ____
Ques. Proofed ____
Ques Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

3-18.1 A projectile has an initial speed of 88 ft/sec. Assume that the projectile is initially at ground level, and that air resistance may be neglected. Find the maximum range of the projectile.

A. 7744 ft.

B. 3872 ft.

C. 484 ft.

D. 242 ft.

E. 121 ft.

ID# 3-18.1
T.O.# 012-05
Skill Rating 2
Diagram? no
Answer: D

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

3-18.2 A projectile has an initial speed of 176 ft/sec. Assume that the projectile is initially at ground level, and that air resistance may be neglected. What is the maximum range of the projectile?

A. 242 ft.
B. 484 ft.
C. 726 ft.
D. 968 ft.
E. 1210 ft.

ID# 3-18.2
T.O.# 012-05
Skill Rating 2
Diagram? no
Answer: D

================
USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made

3-18.3 A projectile is launched from a horizontal plane with an initial speed of 64 ft/sec. Assuming that air resistance may be neglected, what is the maximum horizontal range of the projectile?

A. 32 ft.
B. 64 ft.
C. 96 ft.
D. 128 ft.
E. 160 ft.

ID# 3-18.3
T.O.# 012-05
Skill Rating 2
Diagram? no
Answer: D

================
USNA Accepts ____
Ques. Proofed

3-18.4 A projectile is launched from a horizontal plane with an initial speed of 96 ft/sec. Assume that air resistance is negligible. What is the maximum horizontal range of the projectile?

A. 576 ft.
B. 192 ft.
C. 421 ft.
D. 288 ft.
E. 96 ft.

ID# 3-18.4
T.O.# 012-05
Skill Rating 2
Diagram? no
Answer: D

================
USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____

3-18.5 A projectile is launched from a horizontal plane with an initial speed of 264 ft/sec. Assume that air resistance may be neglected. What is the maximum range of the projectile in the horizontal plane?

A. 2178 ft.
B. 1748 ft.
C. 1318 ft.
D. 2005 ft.
E. 2342 ft.

ID# 3-18.5
T.O.# 012-05
Skill Rating 2
Diagram? no
Answer: A

================
USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____

4-1.1 A body moving with constant velocity is

A. acted upon by a constant resultant force.
B. acted upon by no friction forces.
C. in translational equilibrium.
D. moving with constant non-zero acceleration.

ID# 4-1.1
T.O.# 013-01
Skill Rating 0
Diagram? no
Answer: C

================
USNA Accepts ____
Ques. Proofed TS
Ques. Xeroxed____
Diagram Made

4-1.2 TRUE OR FALSE? A body is in translational equilibrium if it has a constant acceleration.

________

ID# 4-1.2
T.O.# 013-01
Skill Rating 0
Diagram? no
Answer: False

================
USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____
Diagram Made____
Diagram OK

4-1.3 TRUE OR FALSE? A body is in translational equilibrium if it is moving with constant velocity.

________

ID# 4-1.3
T.O.# 013-01
Skill Rating 0
Diagram? no
Answer: True

4-1.4 TRUE OR FALSE? A body is in translational equilibrium if it is acted upon by a constant resultant force.

________

ID# 4-1.4
T.O.# 013-01
Skill Rating 0
Diagram? no
Answer: False

4-1.5 TRUE OR FALSE? A body moving with constant velocity must be in translational equilibrium.

________

ID# 4-1.5
T.O.# 013-01
Skill Rating 0
Diagram? no
Answer: True

4-2.1 A body is set in motion along a horizontal frictionless surface at a speed of two feet per second. What is its speed after five seconds?

________________

ID# 4-2.1
T.O.# 013-02
Skill Rating 1
Diagram? no
Answer: ________

Two feet per second

================

USNA Accepts ____
Ques. Proofed TS
Ques. Xeroxed ____

4-2.2 A particle is set in motion along a horizontal frictionless surface at a speed of five feet per second. What is its speed at the end of seven seconds?

ID# 4-2.2
T.O.# 013-02
Skill Rating 1
Diagram? no
Answer:
Five feet per second

4-2.3 A body is set in motion along a horizontal frictionless surface at a speed of seven feet per second. What is its speed at the end of ten seconds?

ID# 4-2.3
T.O.# 013-02
Skill Rating 1
Diagram? no
Answer:
Seven feet per second

4-2.4 A particle is set in motion along a horizontal frictionless surface at a speed of ten feet per second. What is its speed at the end of five seconds?

ID# 4-2.4
T.O.# 013-02
Skill Rating 1
Diagram? no
Answer:
Ten feet per second

================

4-2.5 A particle is set in motion along a horizontal frictionless surface at a speed of twelve feet per second. What is its speed at the end of ten seconds?

ID# 4-2.5
T.O.# 013-02
Skill Rating 1
Diagram? no
Answer:
Twelve feet per second

================

USNA Accepts ____

4-5.1 A 50 lb weight moves vertically upward at the constant speed of 2 ft/sec. The force acting on the block in the upward direction

A. is greater than 50 lb.
B. is equal to 50 lb.
C. is less than 50 lb.
D. increases as the weight ascends.

ID# 4-5.1
T.O.# 013-04
Skill Rating 1
Diagram? no
Answer: B

================
USNA Accepts ____
Ques. Proofed TSP
Ques. Xeroxed ____

4-5.2 A 30 lb block descends vertically at a constant speed of 3 ft/s. The force acting on the block in the vertically upward direction

A. is less than 30 lb.
B. decreases as the block descends.
C. is greater than 30 lb.
D. is equal to 30 lb.

ID# 4-5.2
T.O.# 013-04
Skill Rating 1
Diagram? no
Answer: D

================
USNA Accepts ____
Ques. Proofed ____

4-5.3 A man pushes a 25 lb ball vertically upward at a constant speed of 2 ft/sec. The magnitude of the force he applies to the ball

A. is less than 25 lb.
B. decreases as the ball ascends.
C. is equal to 25 lb.
D. is greater than 25 lb.

ID# 4-5.3
T.O.# 013-04
Skill Rating 1
Diagram? no
Answer: C

================
USNA Accepts ____
Ques. Proofed TSP
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____

4-5.4 A man lowers vertically a 50 lb ball at a constant speed of 3 ft/sec. The magnitude of the force he applies to the ball

A. decreases as the ball descends.

B. increases as the ball descends.

C. is less than 50 lb.

D. is equal to 50 lb.

ID# 4-5.4

T.O.# 013-04

Skill Rating 1

Diagram? no

Answer: D

================

USNA Accepts ____

Ques. Proofed Td

Ques. Xeroxed____

4-5.5 A man pushes a 40 lb ball vertically upward at a constant speed of 1 ft/sec. The magnitude of the force he applies to the ball

A. is equal to 40 lb.

B. increases at the ball ascends.

C. is greater than 40 lb.

D. decreases as the ball ascends.

ID# 4-5.5

T.O.# 013-04

Skill Rating 1

Diagram? no

Answer: A

================

USNA Accepts ____

Ques. Proofed Td

Ques. Xeroxed

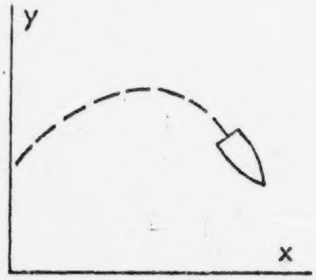
4-6.1 A projectile moves in an x-y plane (horizontal-vertical). The sole force on the projectile is the force due to gravity, a force with magnitude w acting vertically downward. The mass of the projectile is m. Which of the following sets of equations (based upon Newton's second law) is correct?

A. $a_x = w/m$; $a_y = -w/m$

B. $a_x = 0$; $a_y = -w/m$

C. $a_x = w/m$; $a_y = 0$

D. $a_x = -w/m$; $a_y = 0$



ID# 4-6.1

T.O.# 014-01

Skill Rating 1

Diagram? yes

Answer: B

================

USNA Accepts ____

Ques. Proofed Td

Ques. Xeroxed____

Diagram Made____

Diagram OK ____

Diagram Xerox____

To NYIT:

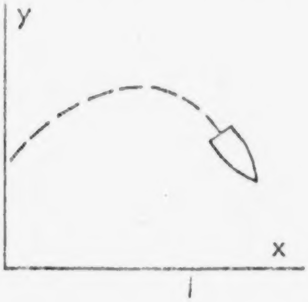
4-6.2 A projectile of mass m moves in an x-y plane (horizontal-vertical) under the action of the force of gravity alone. If we denote this force by w then the set of equations (based on Newton's second law) which correctly describes the motion is

A. $a_x = -w/m$; $a_y = w/m$

B. $a_x = w/m$; $a_y = 0$

C. $a_x = 0$; $a_y = -w/m$

D. $a_x = w/m$; $a_y = -w/m$



ID# 4-6.2
T.O.# 014-01
Skill Rating 1
Diagram? yes
Answer: C

================
USNA Accepts ____
Ques. Proofed Tsd
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____

4-6.3 TRUE OR FALSE? A projectile of mass m moves in a vertical plane under the action of the force of gravity alone. Let w denote the magnitude of the force of gravity; $a_h$, the horizontal acceleration; $a_v$, the vertical acceleration. Then $a_h = 0$, $a_v = w/m$.

______________

ID# 4-6.3
T.O.# 014-01
Skill Rating 1
Diagram? no
Answer: True

================
USNA Accepts ____
Ques. Proofed Tsd
Ques. Xeroxed

4-6.4 TRUE OR FALSE? A projectile of mass m moves in a vertical plane under the action of the force of gravity alone. Let w denote the magnitude of the force of gravity; $a_h$, the horizontal acceleration; and $a_v$, the vertical acceleration. Then $a_h = w/m$, $a_v = 0$.

________

ID# 4-6.4
T.O.# 014-01
Skill Rating 1
Diagram? no
Answer: False

================
USNA Accepts ____
Ques. Proofed Tsd
Ques. Xeroxed ____
Diagram Made ____

4-6.5 TRUE OR FALSE? A projectile of mass m moves in a vertical plane under the action of the force of gravity alone. Let w denote the magnitude of this force; $a_h$, the horizontal acceleration; and $a_v$, the vertical acceleration. Then $a_h = w/m$, $a_v = 0$.

________

ID# 4-6.5
T.O.# 014-01
Skill Rating 1
Diagram? no
Answer: False

4-11.1 Near the surface of Mercury, objects fall with an acceleration of 3.9 $m/sec^2$. What is the weight of a 1000 gram mass at Mercury's surface?

w = ________

ID# 4-11.1
T.O # 015-03
Skill Rating 1
Diagram? no
Answer:
w = 3.9 N

4-11.2 Near the surface of Venus, objects fall with an acceleration of 8.8 $m/sec^2$. What is the weight of a 2000 gram mass at Venus' surface?

w = ________

ID# 4-11.2
T.O # 015-03
Skill Rating 1
Diagram? no
Answer:
w = 17.6 N

4-11.3 Near the surface of Jupiter, objects fall at 26.5 $m/sec^2$. What is the weight of a 3000 gram mass at Jupiter's surface?

w = ________

ID# 4-11.3
T.O.# 015-03
Skill Rating 1
Diagram? no
Answer:
w = 79.5 N

================
USNA Accepts ____
Ques. Proofed TS
Ques. Xeroxed____
Diagram Made____
Diagram OK ____

4-11.4 Near the surface of Saturn, objects fall with an acceleration of 11.8 m/sec$^2$. What is the weight of a 4000 gram mass at Saturn's surface?

w = ________

ID# 4-11.4
T.O.# 015-03
Skill Rating 1
Diagram? no
Answer:
w = 47.2 N

4-11.5 Near the surface of Mars, objects fall with an acceleration of 3.9 m/sec$^2$. What is the weight of a 2000 gram mass at Mars' surface?

w = ________

ID# 4-11.5
T.O.# 015-03
Skill Rating 1
Diagram? no
Answer:
w = 7.8 N

4-16.1 TRUE OR FALSE? Two midshipmen engage in a tug-of-war by pulling at opposite ends of a towel. The reaction force to the force exerted by one midshipman on the towel is the force exerted by the towel on him.

________

ID# 4-16.1
T.O.# 016-00
Skill Rating 0
Diagram? no
Answer: True

4-16.2 TRUE OR FALSE? Two midshipmen engage in a tug-of-war by pulling at opposite ends of a towel. The reaction force to the force exerted by one midshipman on the towel is the force the other midshipman exerts on the towel.

________

ID# 4-16.2
T.O.# 016-00
Skill Rating 0
Diagram? no
Answer: False

USNA Accepts ____
Ques. Proofed

4-16.3 TRUE OR FALSE? Two midshipmen engage in a tug-of-war by pulling at opposite ends of a towel. The forces exerted by the midshipmen on the towel are an example of an action-reaction pair.

________

ID# 4-16.3

T.O.# 016-00

Skill Rating 0

Diagram? no

Answer: False

4-16.4 TRUE OR FALSE? A man pushes a block along a horizontal surface at constant speed. The reaction force to the force exerted by the man on the box is the force that the surface exerts on the block.

________

ID# 4-16.4

T.O.# 016-00

Skill Rating 0

Diagram? no

Answer: False

4-16.5 TRUE OR FALSE? A man pushes a box along a horizontal surface at constant speed. The reaction force to the force he exerts on the box is the force the box exerts on him.

________

ID# 4-16.5

T.O.# 016-00

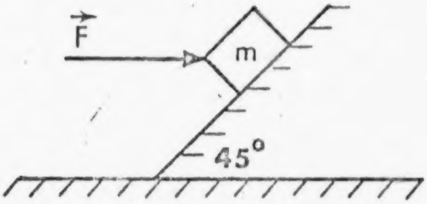
Skill Rating 0

Diagram? no

Answer: True

4-21.1 A force $\vec{F}$ of 12 nt pushes a 2-kg block along a plane inclined at 45°. (See sketch) $\vec{F}$ is parallel to the horizontal surface Calculate the magnitude of the normal force on the block.

N = ________



ID# 4-21.1

T.O.# 014-01

Skill Rating 1

Diagram? yes

Answer: ________

N = 22.3 nt

================

USNA Accepts ____

Ques. Proofed

Ques. Xeroxed____

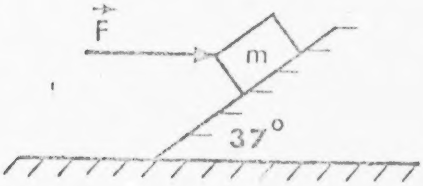
Diagram Made____

Diagram OK ____

Diagram Xerox

4-21.2 A force $\vec{F}$ of 16 nt pushes a 3-kg block up a plane inclined at 37°. (See sketch). $\vec{F}$ is parallel to the horizontal surface. Calculate the magnitude of the normal force on the block.

N = ________



ID# 4-21.2

T.O.# 014-01

Skill Rating 1

Diagram? yes

Answer:
N = 33.1 nt

================

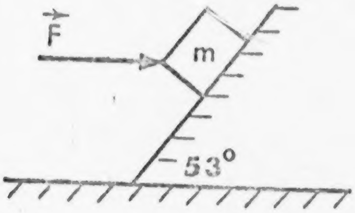
USNA Accepts ____

Ques. Proofed T8
Ques. Xeroxed ____

Diagram Made ____
Diagram OK ____
Diagram Xerox

4-21.3 A force $\vec{F}$ of 20 nt pushes a 2-kg mass up a plane inclined at 53°. (See sketch) $\vec{F}$ is parallel to the horizontal. Calculate the magnitude of the normal force on the block.

N = ________



ID# 4-21.3

T.O.# 014-01

Skill Rating 1

Diagram? yes

Answer:
N = 27.8 nt

================

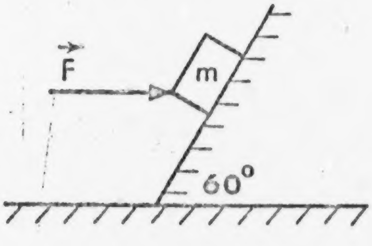
USNA Accepts ____

Ques. Proofed T8
Ques. Xeroxed ____

Diagram Made ____
Diagram OK

4-21.4 A force $\vec{F}$ of 15 nt pushes a 2-kg mass up a plane inclined at 60°. (See sketch) $\vec{F}$ is parallel to the horizontal. Calculate the magnitude of the normal force on the block.

N = ________



ID# 4-21.4

T.O.# 014-01

Skill Rating 1

Diagram? yes

Answer:
N = 22.8 nt

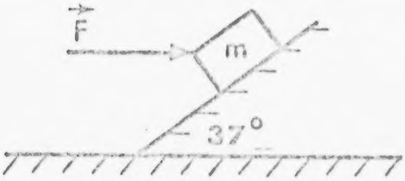
================

USNA Accepts ____

Ques. Proofed T8

4-21.5 A force $\vec{F}$ of 20 nt pushes a 4-kg mass up a plane inclined at 37° with the horizontal. (See sketch) F is parallel to the horizontal. Calculate the magnitude of the normal force on the block.

N = ________



ID# 4-21.5
I.O # 014-01
Skill Rating 1
Diagram? yes
Answer:
N = 43.4 nt

================

USNA Accepts ____
Ques. Proofed TS
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____

4-26.1 A spring balance rests on a horizontal table. Two midshipmen pull at opposite ends of the balance each with a force of 30-lb. What is the reading on the spring balance?

________

ID# 4-26.1
I.O # 016-00
Skill Rating 1
Diagram? no
Answer: 30-lb

4-26.2 A spring balance rests on a horizontal table, and two midshipmen pull at opposite ends of the balance, each with a force of 50-lb. What is the reading on the spring balance?

________

ID# 4-26.2
I.O # 016-00
Skill Rating 1
Diagram? no
Answer: 50-lb

4-26.3 A spring balance rests on a horizontal table and two midshipmen pull at opposite ends of the balance, each with a force of 45-lb. What is the reading on the spring balance?

________

ID# 4-26.3
I.O # 016-00
Skill Rating 1
Diagram? no
Answer: 45-lb

================

4-26.4 A spring balance rests on a horizontal table and two midshipmen pull at opposite ends of the balance, each with a force of 60-lb. What is the reading on the spring balance?

__________

ID# 4-26.4

I.O # 016-00

Skill Rating 1

Diagram? no

Answer: 60-lb

================

USNA Accepts ____

4-26.5 A spring balance rests on a horizontal table. Two midshipmen pull at opposite ends of the balance, each with a force of 40-lb. What is the reading on ths spring balance?

__________

ID# 4-26.5

I.O # 016-00

Skill Rating 1

Diagram no

Answer: 40-lb

================

USNA Accepts ____

Ques. Proofed TS

Ques. Xeroxed____

Diagram Made____

Diagram OK ____

Diagram Xerox

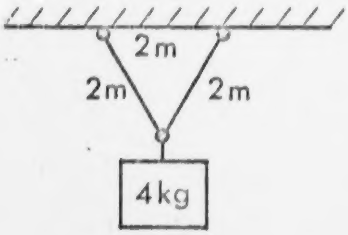
4-29.1 A mass of 4-kg is supported from the ceiling by massless cords each of length 2 m. The distance between the points of support on the ceiling is 2 m. What is the magnitude of the tension in either cord?

A. 11.3 nt

B. 5.0 nt

C. 22.6 nt

D. 6.5 nt



ID# 4-29.1

I.O # 013-09

Skill Rating 3

Diagram? yes

Answer: C

================

USNA Accepts ____

Ques. Proofed TS

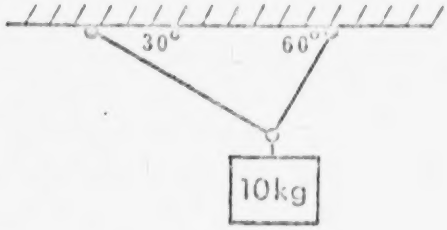
Ques. Xeroxed____

Diagram Made____

Diagram OK

4-29.2 A 10-kg mass is suspended from the ceiling by two massless cords which form angles of 30° and 60° with the ceiling. (See sketch) What is the magnitude of the tension in the longer cord?

A. 24.5 nt
B. 49 nt
C. 36 nt
D. 42 nt

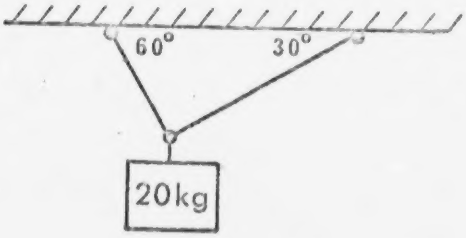


ID# 4-29.2
T.O # 013-09
Skill Rating 3
Diagram? yes
Answer: B

==================
USNA Accepts ____
Ques. Proofed TS
Ques. Xeroxed____
Diagram Made____
Diagram OK ____
Diagram Xerox

4-29.3 A 20-kg mass is suspended from the ceiling by two massless cords which form angles with the ceiling of 30° and 60°. (See sketch) What is the magnitude of the tension in the longer cord?

A. 98 nt
B. 78 nt
C. 69 nt
D. 49 nt

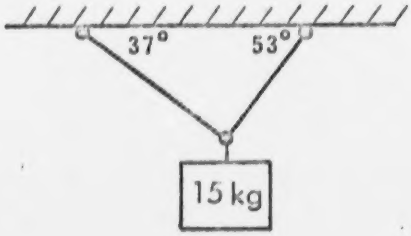


ID# 4-29.3
T.O # 013-09
Skill Rating 3
Diagram? yes
Answer: A

==================
USNA Accepts ____
Ques. Proofed TS
Ques. Xeroxed____

4-29.4 A 15-kg mass is suspended from the ceiling by two massless cords. The cords make angles of 37° and 53° with the ceiling. (See sketch) What is the magnitude of the tension in the longer cord?

A. 22 nt
B. 44 nt
C. 88 nt
D. 102 nt

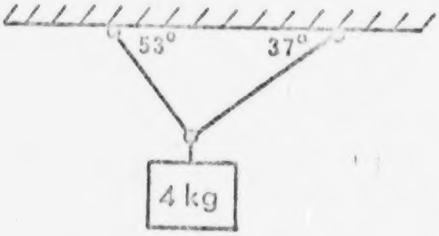


ID# 4-29.4
T.O.# 013-09
Skill Rating 3
Diagram? yes
Answer: C

==================
USNA Accepts ____
Ques. Proofed TS
Ques. Xeroxed____
Diagram Made

4-29.5 A 4-kg mass is suspended from the ceiling by two massless cords. The cords make angles of 37° and 53° with the ceiling. (See sketch) What is the magnitude of the tension in the shorter cord?

A. 12.8 nt
B. 22.4 nt
C. 31.4 nt
D. 62.8 nt



ID# 4-29.5
T.O.# 013-09
Skill Rating 3
Diagram? yes
Answer: C

==================

USNA Accepts ____
Ques. Proofed TS
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox

4-32.1 A sled of mass m slides down an icy slope inclined at θ° with the horizontal. Assume frictionless conditions and find (a) the acceleration and (b) the resultant force on the sled if m = 20 kg and θ = 37°

ID# 4-32.1
T.O # 014-00
Skill Rating 2
Diagram? no
Answer: 117.6 nt

4-32.2 A sled of mass m slides down a plane inclined at θ° with the horizontal. Assume frictionless conditions, and find (a) the acceleration of the sled and (b) the reaction force N acting on the sled if m = 10 kg and θ = 37°.

ID# 4-32.2
T.O # ~~014-00~~ 016-00
Skill Rating 2
Diagram? no
Answer: 78.4 nt

4-32.3 A sled of mass m slides down a frictionless plane inclined at an angle θ with the horizontal. Find (a) the resultant force acting on the sled, and (b) the normal reaction force on the sled, if m = 5 kg and θ = 37°.

ID# 4-32.3
T.O.# ~~014-00~~ 016-00
Skill Rating 2
Diagram? no
Answer: 39.2 nt

4-32.4 A 30-kg sled slides down a frictionless plane inclined at an angle of 53° with the horizontal. Find (a) the acceleration of the sled, (b) the resultant force on the sled, and (c) the reaction force on the sled.

ID# 4-32.4
T.O.# ~~014-00~~ 016-00
Skill Rating 2
Diagram? no
Answer: 176.4 nt

USNA Accepts ____
Ques. Proofed TS

---

4-32.5 A 10-kg sled slides down a frictionless plane inclined at an angle of 45° with the horizontal. Find (a) the acceleration of the sled, and (b) the reaction force on the sled.

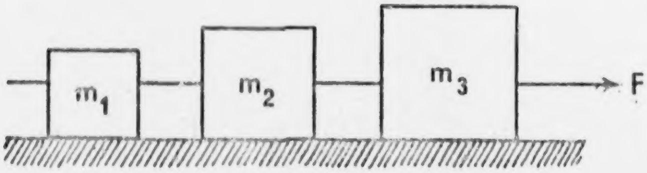
ID# 4-32.5
T.O.# ~~014-00~~ 016·00
Skill Rating 2
Diagram? no
Answer: 69 nt

USNA Accepts ____
Ques. Proofed TS
Ques. Xeroxed____
Diagram Made____

---

5-1.1 A force of 30 nt accelerates three blocks of mass $m_1 = 10$kg, $m_2 = 20$kg, and $m_3 = 30$ kg. What is the tension in the cord connecting block two and block three. (Assume the plane to be frictionless.)

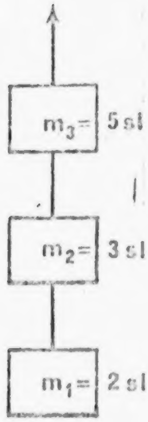
A. 25
B. 20 nt
C. 30 nt
D. 15 nt



ID# 5-1.1
T.O.# 014-00
Skill Rating 2
Diagram? yes
Answer: D

USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____
Diagram Made____
Diagram OK ____
Diagram Xerox____

5-1.2



A force F lifts three masses vertically upward. If the tension in the cord between $m_1$ and $m_2$ is 70 lbs, what is the force F?

A. 350 lb
B. 320 lb
C. 70 lb
D. 960 lb

ID# 5-1.2
T.O.# 014-00
Skill Rating 2
Diagram? yes
Answer: A

================

USNA Accepts ____

Ques. Proofed____
Ques. Xeroxed____

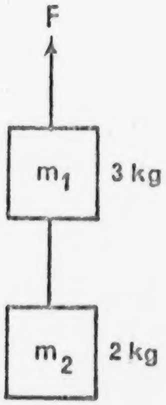
Diagram Made____
Diagram OK ____
Diagram Xerox____

To NYIT ____
To Computer____
OK Computer____

Answer Record____

NYIT, Fall 1970

5-1.3



A force F = 45 nt is used to lower two masses $m_1$ = 3 kg and $m_2$ = 2 kg. What is the tension in the cord between $m_1$ and $m_2$?

A. 18 nt
B. 45 nt
C. 21.2 nt
D. 27 nt

ID# 5-1.3
T.O.# 014-00
Skill Rating 2
Diagram? yes
Answer: A

================

USNA Accepts ____

Ques. Proofed____
Ques. Xeroxed____

Diagram Made____
Diagram OK ____
Diagram Xerox____

To NYIT ____
To Computer____
OK Computer____

Answer Record____

NYIT, Fall 1970

5-1.4 Two blocks on a horizontal frictionless plane are tied together with a cord and moved by a horizontal force, F, pulling on block number one. The mass of block one is 20 kg and the mass of block two is 30 kg. If the tension in the cord between the blocks is 45 nt., what is the force, F?

A. 49 nt.
B. 30 nt.
C. 45 nt.
D. 75 nt.

ID# 5-1.4
T.O.# 014-00
Skill Rating 1
Diagram? no
Answer: D

================

USNA Accepts ____

Ques. Proofed S✓
Ques. Xeroxed ____

Diagram Made ____
Diagram OK ____
Diagram Xerox ____

To NYIT ____
To Computer ____
OK Computer ____

Answer Record ____

NYIT, Fall 1970

5-1.5 A horizontal force F = 90 nt is applied to block of mass $m_1$ which is connected to another block of mass $m_2$ = 40kg by a light inextensible cord. The blocks are on a horizontal frictionless plane and the tension in the cord connecting the two blocks is 60 nt. Find the mass, $m_1$, of the first block.

A. 20kg
B. 50kg
C. 60kg
D. 90kg

ID# 5-1.5
T.O.# 014-00
Skill Rating 1
Diagram? no
Answer: A

================

USNA Accepts ____

Ques. Proofed ____
Ques. Xeroxed ____

Diagram Made ____
Diagram OK ____
Diagram Xerox ____

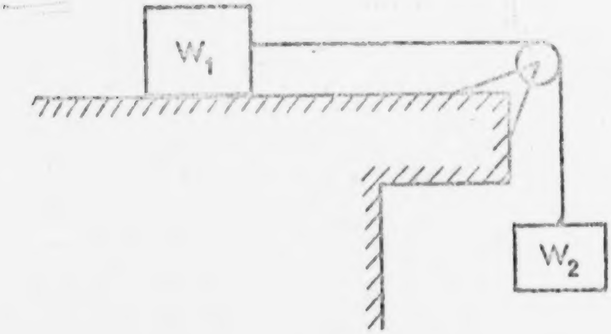
To NYIT ____
To Computer ____
OK Computer ____

Answer Record ____

NYIT, Fall 1970

5-2.1 $w_1$ = 96 lbs. and $w_2$ = 32 lbs. What is the acceleration of block one? Assume the idealized conditions of a frictionless table and massless pulley and cord.

a = ________



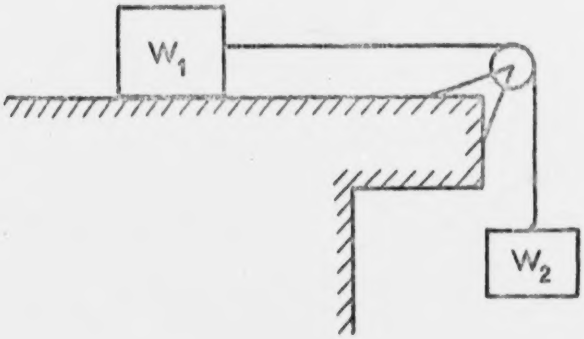
ID# 5-2.1
T.O.# 014-00
Skill Rating 2
Diagram? yes
Answer: 8 ft/sec$^2$

================

USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____
Diagram Made____
Diagram OK ____
Diagram Xerox____
To NYIT ____
To Computer____
OK Computer____
Answer Record____
NYIT, Fall 1970

5-2.2 $w_1$ = 96 lbs. and $w_2$ = 32 lbs. What is the tension in the cord connecting $w_1$ and $w_2$? Assume the idealized conditions of a frictionless table and massless pulley and cord.

T = ________

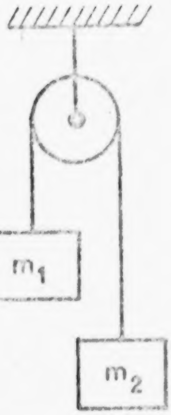


ID# 5-2.2
T.O.# 014-00
Skill Rating 2
Diagram? yes
Answer: 24 lbs.

================

USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____
Diagram Made____
Diagram OK ____
Diagram Xerox____
To NYIT ____
To Computer____
OK Computer____
Answer Record____
NYIT, Fall 1970

5-2.3



Two masses $m_1 = 12$ kg and $m_2 = 15$ kg are connected by a light inextensible cord through a light frictionless pulley. What is the acceleration of mass $m_2$?

a = ________

ID# 5-2.3

T.O.# 014-00

Skill Rating 2

Diagram? yes

Answer: ________
a = 1.09 m/sec$^2$
(range: 1.06 to 1.12)

================

USNA Accepts ____

Ques. Proofed____
Ques. Xeroxed____

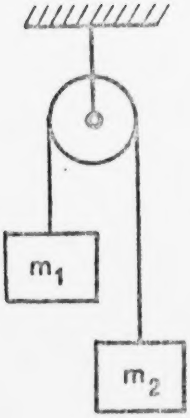
Diagram Made____
Diagram OK ____
Diagram Xerox____

To NYIT ____
To Computer____
OK Computer____

Answer Record____

NYIT, Fall 1970

5-2.4



Two masses $m_1 = 1.5$ kg and $m_2 = 3$ kg are connected by a light inextensible cord through a frictionless massless pulley. Find the tension in the cord.

T = ________

ID# 5-2.4

T.O.# 014-00

Skill Rating 2

Diagram? yes

Answer: ________
T = 19.6 nt.
(range: 19.2 to 20.0)

================

USNA Accepts ____

Ques. Proofed____
Ques. Xeroxed____

Diagram Made____
Diagram OK ____
Diagram Xerox____

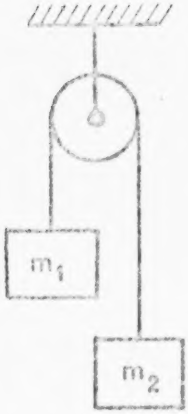
To NYIT ____
To Computer____
OK Computer____

Answer Record____

NYIT, Fall 1970

5-2.5

Two masses $m_1$ and $m_2$ are connected by a light inextensible cord through a frictionless pulley. The tension in the cord is 25.9 nt. If $m_1 = 2$ kg find $m_2$.



$m_2$ = ________

ID# 5-2.5
T.O # 014-00
Skill Rating 2
Diagram? yes
Answer: ________
$m_2 = 3.96$ kg
(range: 3.92 to 4.00)
================
USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____
Diagram Made____
Diagram OK ____
Diagram Xerox____
To NYIT ________
To Computer______
OK Computer______
Answer Record____
NYIT, Fall 1970

5-5.1 A 20 lb. block on a plane inclined at angle of 30° with the horizontal is given an initial velocity, $V_o$, down the plane. The coefficient of kinetic friction is 0.45 and the coefficient of static friction is 0.65. What will the block do?

A. Continue down the plane at the initial velocity, $V_o$.

B. Accelerate down the plane.

C. Slow down and eventually come to rest on the inclined plane.

ID# 5-5.1
T.O.# 017-00
Skill Rating 1
Diagram? no
Answer: B
================
USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____
Diagram Made____
Diagram OK ____
Diagram Xerox____
To NYIT ________
To Computer______
OK Computer______
Answer Record____
NYIT, Fall 1970

5-5.2 A 10 lb. block is given an initial velocity, $V_o$, up a plane inclined at an angle of 20° with the horizontal. The coefficient of kinetic friction is 0.35 and the coefficient of static friction is 0.60. What will the block do?

A. Slide up the plane, come to rest and remain at rest.

B. Slide up the plane, come to rest then slide down the plane with a constant velocity.

C. Slide up the plane, come to rest then slide down the plane with a constant acceleration.

ID# 5-5.2
T.O.# 017-00
Skill Rating 1
Diagram? no
Answer A

================
USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____
Diagram Made____
Diagram OK ____
Diagram Xerox____

5-5.3 A block with a mass of 2.0 sl. is given an initial velocity of 5 ft. per second down a plane inclined at 45° with the horizontal. The coefficient of kinetic friction is 1.0 and the coefficient of static friction is 1.2. What will the block do?

A. Slide down the plane with a constant velocity of 5 ft/sec.

B. Accelerate down the plane.

C. Slow down and come to rest on the incline.

ID# 5-5.3
T.O.# 017-00
Skill Rating 1
Diagram? no
Answer: A

================
USNA Accepts ____

5-5.4 A 50 lb. block on a plane inclined at an angle of 15° with the horizontal is released from rest. The coefficient of static friction is 0.25 and the coefficient of kinetic friction is 0.20. What will the block do?

A. Remain at rest.

B. Slide with constant velocity down the plane.

C. Accelerate down the plane.

ID# 5-5.4
T.O.# 017-00
Skill Rating 1
Diagram? no
Answer: C

================
USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____
Diagram Made____
Diagram OK

5-5.5 A 20 lb. block is given an initial velocity, $V_0$, down a plane inclined at an angle of 20° with the horizontal. The coefficient of kinetic friction is 0.38 and the coefficient of static friction is 0.48. What will the block do?

A. Continue down the incline with a constant velocity.

B. Slow down and come to rest on the incline.

C. Accelerate down the incline.

ID# 5-5.5
T.O.# 017-00
Skill Rating 1
Diagram? no
Answer: B
=================
USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____

5-10.1 A block placed at rest on a plane inclined at an angle of 40° with the horizontal remains at rest. If the angle of inclination is increased only slightly the block will start to move down the plane. What is the coefficient of static friction?

$\mu s$ = ____________

ID# 5-10.1
T.O.# 017-00
Skill Rating 1
Diagram? no
Answer: .840
(range: .835 to .845)
=================
USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____
Diagram Made____

5-10.2 A block placed on a plane inclined at an angle of 45° with the horizontal accelerates down the plane with a = 16 ft/sec$^2$. What is the coefficient of kinetic friction?

$\mu k$ = __________

ID# 5-10.2
T.O.# 017-00
Skill Rating 1
Diagram? no
Answer: .293
(range: .288 to .298)
=================
USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____
Diagram Made

5-10.3 The coefficient of kinetic friction between a block and an inclined plane is 0.40. The block, if given an initial velocity down the plane, will continue down the plane at a constant velocity if the angle of inclination is

θ = ________

ID# 5-10.3
T.O.# 017-00
Skill Rating 1
Diagram? no
Answer: 21.8°
(range: 21.5 to 22.1)

==================

USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____

5-10.4 A block is placed at rest on an inclined plane. The coefficient of static friction is 0.60 and the coefficient of kinetic friction is 0.50. If the block is to remain at rest, what is the greatest angle of inclination the plane could have?

θ = __________

ID# 5-10.4
T.O.# 017-00
Skill Rating 1
Diagram? no
Answer: 31.0°
( range: 30.7° to 31.3°)

==================

USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____
Diagram Made____
Diagram OK ____
Diagram Xerox

5-10.5 A block on a plane inclined at an angle of 25° with the horizontal is given an initial velocity down the plane. The block has an acceleration of 8 $ft/sec^2$ up the incline. What is the coefficient of kinetic friction?

$\mu k$ = ________

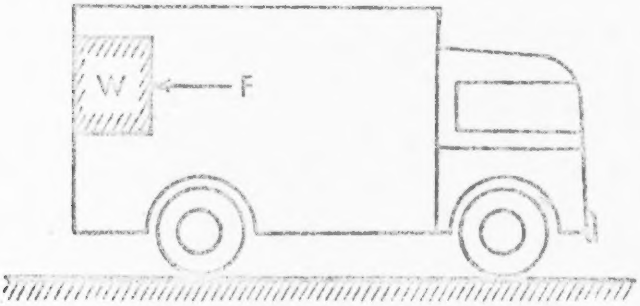
ID# 5-10.5
T.O.# 017-00
Skill Rating 1
Diagram? no
Answer: .742
(range: .738 to .748)

==================

USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____
Diagram Made

5-11.1 You are holding a 10 lb. block against the vertical rear wall of a truck by applying a force F. The coefficient of static and kinetic friction are 0.6 and 0.5 respectively. If the truck starts from rest and continually increases its acceleration, what must the acceleration be when the force F can be removed and have the block remain at rest relative to the truck?

a = ________



ID# 5-11.1
T.O.# 017-00
Skill Rating 2
Diagram? yes
Answer: ________
a = 53.3 ft/sec$^2$
(range: 52.6 to 54.0)

==================

USNA Accepts ___

Ques. Proofed ___
Ques. Xeroxed ___

Diagram Made ___
Diagram OK ___
Diagram Xerox ___

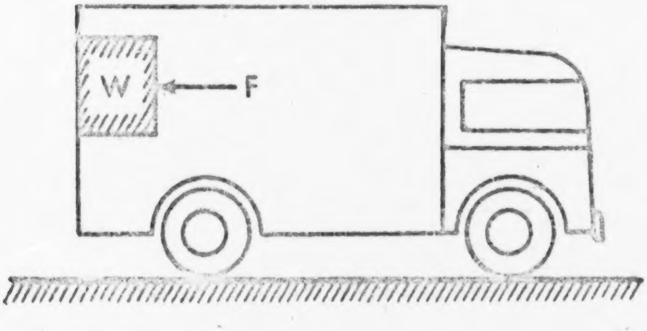
To NYIT ___
To Computer ___
OK Computer ___

Answer Record ___

NYIT, Fall 1970

5-11.2 A truck is accelerating horizontally at 16 ft/sec$^2$. What force, F, applied to a 50lb. block, is required to hold the block at rest relative to the truck? The coefficient of static and kinetic friction are 0.50 and 0.40 respectively.

F = ________



ID# 5-11.2
T.O.# 017-00
Skill Rating 2
Diagram? yes
Answer: 75 lb.

==================

USNA Accepts ___

Ques. Proofed ___
Ques. Xeroxed ___

Diagram Made ___
Diagram OK ___
Diagram Xerox ___

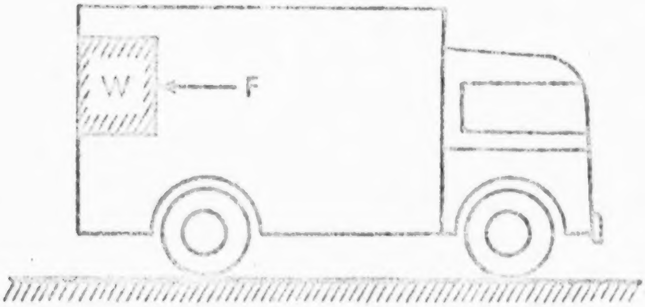
To NYIT ___
To Computer ___
OK Computer ___

Answer Record ___

NYIT, Fall 1970

5-11.3 A truck is accelerating horizontally at 16 ft/sec$^2$. A force F = 35 lb. is required to hold a 20lb. block on the rear wall of the truck at rest relative to the truck. What is the coefficient of static friction between the block and the wall of the truck?

μs = ________



ID#_5-11.3___
T.O #_017-00___
Skill Rating _2_
Diagram? _yes_
Answer: _.445_

(range: .440 to
.450)

================
USNA Accepts ___

Ques. Proofed_✓_
Ques. Xeroxed___

Diagram Made___
Diagram OK ___
Diagram Xerox___

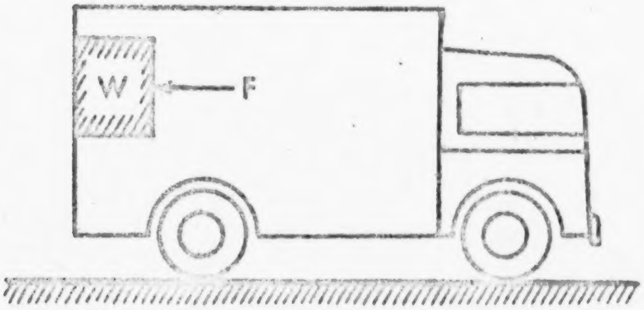
To NYIT ___
To Computer___
OK Computer___

Answer Record___

NYIT, Fall 1970

5-11.4 The truck is on an elevator and is to be raised from the hold of a ship. A force F = 50 lb. is used to hold the 20 lb. block against the rear of the truck as shown. The coefficients of static and kinetic friction are 0.50 and 0.40 respectively. At what upward acceleration of the elevator will the block begin to fall?

a = ________



ID#_5-11.4___
T.O.#_017-00___
Skill Rating _2_
Diagram? _yes_
Answer: _8 ft/sec

================
USNA Accepts ___

Ques. Proofed___
Ques. Xeroxed___

Diagram Made___
Diagram OK ___
Diagram Xerox___

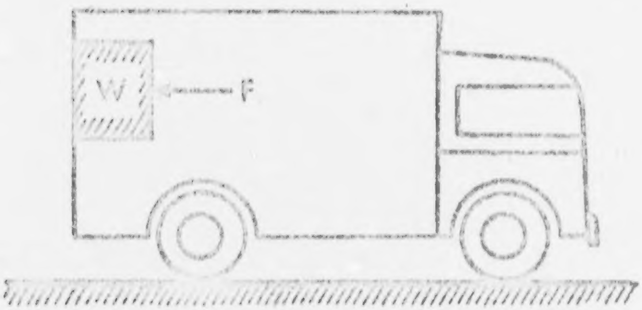
To NYIT ___
To Computer___
OK Computer___

Answer Record___

NYIT, Fall 1970

5-11.5 The truck is on an elevator and is to be lowered into the hold of a ship. The elevator has an acceleration of 4 ft/sec$^2$ when going down. If, during this period of acceleration, a force F = 25 lb. is required to hold the 10 lb. block at rest relative to the truck, what is the coefficient of static friction between the block and the truck?

$\mu s =$ ________



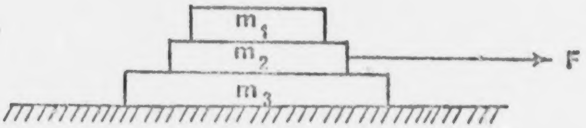
ID# 5-11.5
T.O # 017-00
Skill Rating 2
Diagram? yes
Answer: .35
(range: .32 to .38)

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

5-12.1 Three blocks $m_1$, $m_2$ and $m_3$ of mass 1.0 kg, 2.0 kg, and 3.0 kg respectively are stacked on a frictionless plane as shown in the diagram. The coefficient of static friction between the surfaces of any two blocks is 0.50. A horizontal force of 29.4 nt is applied to the middle block, $m_2$.

The three blocks will not move relative to each other.

☐ True ☐ False



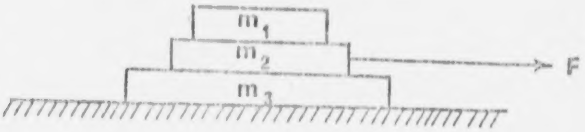
ID# 5-12.1
T.O # 017-00
Skill Rating 2
Diagram? yes
Answer: True

USNA Accepts ____
Ques. Proofed Ta
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYII ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

5-12.2 Three blocks $m_1$, $m_2$, and $m_3$ of mass 1.0 kg, 2.0 kg and 3.0 kg respectively are stacked on a frictionless plane as shown in the diagram. The coefficient of static or kinetic friction between the surfaces of any two blocks is 0.50. A horizontal force F, of 36 nt is applied to the middle block, $m_2$.

The two blocks $m_1$ and $m_3$ will move to the left relative to block $m_2$, but will not move relative to each other.

☐ True ☐ False



ID# 5-12.2
TO# 017-00
Skill 2 Type ____
Diagram? yes
Ans: True

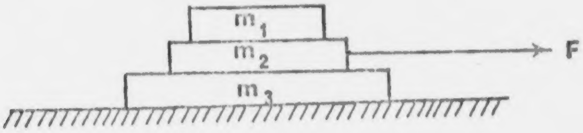
(as revised)

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

5-12.3 Three blocks $m_1$, $m_2$ and $m_3$ of mass 2.5 kg, 5.0 kg and 5.0 kg respectively are stacked on a frictionless plane as shown in the diagram. The coefficient of static friction and the coefficient of kinetic are both 0.4 between the surfaces of any two blocks. A force F of 68.6 nt is applied horizontally to the middle block, $m_2$.

The two blocks $m_2$ and $m_3$ will move to the right relative to $m_1$ but will not move relative to each other.

☐ True ☐ False



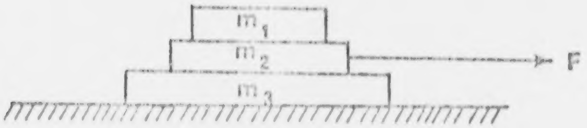
ID# 5-12.3
T.O # 017-00
Skill Rating 2
Diagram? yes
Answer: True

USNA Accepts ____
Ques. Proofed To
Ques Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

5-12.4 Three blocks $m_1$, $m_2$ and $m_3$ of mass 2.0 kg, 4.0 kg and 6.0 kg respectively are stacked on a frictionless plane as shown in the diagram. The coefficient of static friction between the surfaces of any two blocks is 0.50. A horizontal force of 58.8 nt. is applied to the middle block, $m_2$, causing all three blocks to have equal acceleration to the right.

If masses $m_1$ and $m_3$ were doubled, the three blocks would still have an equal acceleration to the right.

☐ True ☐ False



ID# 5-12.4
T.O.# 017-00
Skill Rating 2
Diagram? yes
Answer: True

USNA Accepts ____
Ques. Proofed T.A.
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

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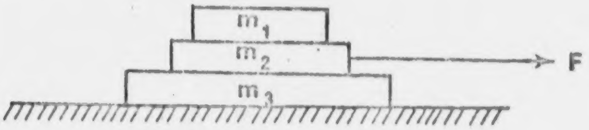
5-12.5 The three blocks $m_1$, $m_2$ and $m_3$ of mass 2.0 kg, 4.0 kg and 6.0 kg respectively are stacked on a frictionless plane as shown in the diagram. The coefficients of static and kinetic friction between the surfaces of any two blocks are both 0.50. A horizontal force of 58.8 nt is applied to the middle block, $m_2$, causing all three blocks to have equal acceleration to the right.

If mass of $m_3$ is suddenly increased by a factor of 10 ($m_3' = 10m_3$) the acceleration of $m_3$ will be reduced but the acceleration of $m_1$ and $m_2$ will remain the same.

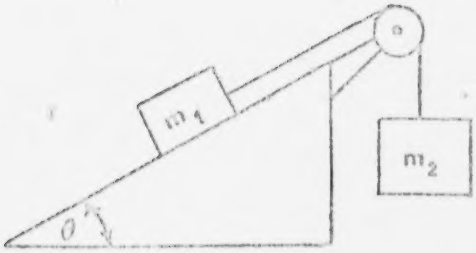
☐ True ☐ False



ID# 5-12.5
T.O.# 017-00
Skill Rating 2
Diagram? yes
Answer: True

USNA Accepts ____
Ques. Proofed T.A.
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

5-13.1



The two blocks are connected by a light inextensible string which passes over a frictionless, massless pulley. The coefficient of static and kinetic friction between the block and the plane is 0.06. The angle θ is 30°, $m_1 = 10$ kg and $m_2 = 3$ kg. What is the acceleration of $m_2$?

A. 2.16 m/sec$^2$ upward

B. .0466 m/sec$^2$ downward

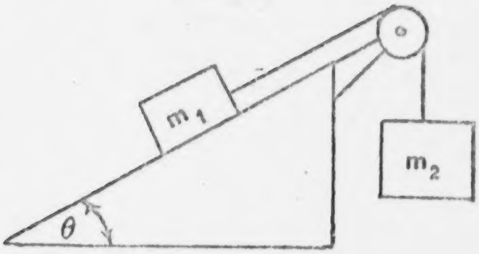
C. 4.46 m/sec$^2$ downward

D. 1.11 m/sec$^2$ upward

ID# 5-13.1
T.O.# 017-00
Skill Rating 2
Diagram? yes
Answer: D

USNA Accepts ___
Ques. Proofed Td
Ques. Xeroxed___
Diagram Made___
Diagram OK ___
Diagram Xerox___
To NYIT ___
To Computer___
OK Computer___
Answer Record___
NYIT, Fall 1970

5-13.2



The two blocks are connected by a light inextensible string which passes over a frictionless massless pulley. The angle θ is 60° and $m_1 = m_2 = 10$ kg. If at rest both blocks will remain at rest but if $m_2$ is given a downward velocity it will continue downward at the same velocity. What is the coefficient of kinetic friction between the block and the plane?

A. 0.27

B. 0.97

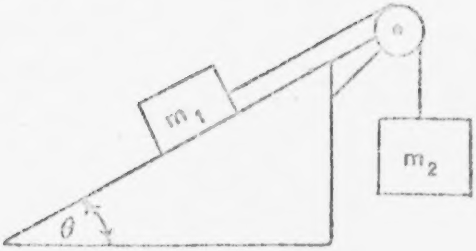
C. 1.42

D. 1.73

ID# 5-13.2
T.O.# 017-00
Skill Rating 2
Diagram? yes
Answer: A

USNA Accepts ___
Ques. Proofed Td
Ques. Xeroxed___
Diagram Made___
Diagram OK ___
Diagram Xerox___
To NYIT ___
To Computer___
OK Computer___
Answer Record___
NYIT, Fall 1970

5-13.3



The two blocks are connected by a light inextensible string which passes over a frictionless, massless pulley. The coefficient of static and kinetic friction between the block and the plane is 0.06. The angle θ is 30°, $m_1$ = 10 kg and $m_2$ = 3 kg. What is the tension in the string connecting the two blocks?

A. 35.9 nt.

B. 42.8 nt.

C. 32.7 nt.

D. 27.5 nt.

ID# 5-13.3

T.O.# 017-00

Skill Rating 2

Diagram? yes

Answer: C

================

USNA Accepts ____

Ques. Proofed TA
Ques. Xeroxed ____

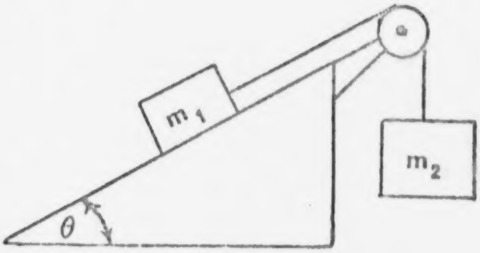
Diagram Made ____
Diagram OK ____
Diagram Xerox ____

To NYIT ____
To Computer ____
OK Computer ____

Answer Record ____

NYIT, Fall 1970

5-13.4



The two blocks are connected by a light inextensible string which passes over a frictionless massless pulley. The coefficient of static and kinetic friction between the block and the plane is 0.50. The angle θ is 45°, $m_1$ = 3 kg and $m_2$ = 5 kg. What is the acceleration of $m_2$?

A. .227 m/sec$^2$

B. 2.23 m/sec$^2$

C. 3.52 m/sec$^2$

D. 4.83 m/sec$^2$

ID# 5-13.4

T.O.# 017-00

Skill Rating 2

Diagram? yes

Answer: B

================

USNA Accepts ____

Ques. Proofed TA
Ques. Xeroxed ____

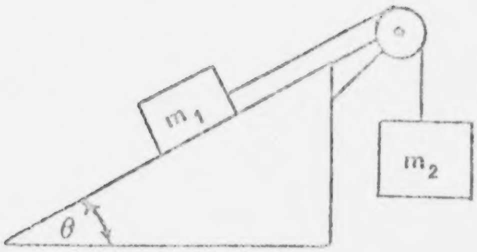
Diagram Made ____
Diagram OK ____
Diagram Xerox ____

To NYIT ____
To Computer ____
OK Computer ____

Answer Record ____

NYIT, Fall 1970

5-13.5



The two blocks are connected by a light inextensible string which passes over a frictionless massless pulley. The coefficient of static and kinetic friction between the block and the plane is 0.50. The angle $\theta$ is 45°, $m_1 = 3$ kg and $m_2 = 5$ kg. What is the tension in the string connecting the two blocks?

A. 24.8 nt.

B. 31.8 nt.

C. 37.8 nt.

D. 48.8 nt.

ID# 5-13.5
T.O.# 017-00
Skill Rating 2
Diagram? yes
Answer: C

================
USNA Accepts ____
Ques. Proofed Td
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____

5-18.1 A 160 lb man stands on a pair of scales inside an elevator. The elevator accelerates downward at 4 ft/sec$^2$. What weight do the scales read?

w = ________

ID# 5-18.1
T.O.# 016-00
Skill Rating 1
Diagram? no
Answer: 140 lbs.

================
USNA Accepts ____

5-18.2 A 140 lb man stands on a pair of scales in an elevator. The scales read 180 lb. Assuming the scales are accurate, what is the acceleration (magnitude and direction) of the elevator?

a = ________

ID# 5-18.2
T.O.# 016-00
Skill Rating 1
Diagram? no
Answer: ________
4 ft/sec$^2$
upward

================
USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK

5-18.3 A man stands on a pair of scales inside an elevator. The scales read 198 lb, when the elevator is accelerating upward at 4 ft/sec$^2$. Assuming the scales are accurate, what is the true weight of the man?

w = ________

ID# 5-18.3
T.O.# 016-00
Skill Rating 1
Diagram? no
Answer: 176 lbs.

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____

5-18.4 A man stands on a pair of scales inside an elevator. The scales read 130 lb. but the man's true weight is 160 lb. What is the acceleration (magnitude and direction) of the elevator?

a = ________

ID# 5-18.4
T.O.# 016-00
Skill Rating 1
Diagram? no
Answer: ________
6 ft/sec$^2$
down

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made

5-18.5 A man stands on a pair of scales inside an elevator. The scales read 119 lb when the elevator is accelerating downward at 4 ft/sec$^2$. Assuming the scales are accurate, what is the true weight of the man?

w = ________

ID# 5-18.5
T.O.# 016-00
Skill Rating 1
Diagram? no
Answer: 136 lb.

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____

6-1.1 The engine of a Triumph TR-3 is red-lined at 5000 rpm (rev/min). At maximum rpm a point on the rim of a flywheel of radius 0.25 ft will have a tangential velocity, measured in ft/sec of

A. 1250

B. 131

C. 20.8

D. 3.32

ID# 6-1.1
T.O.# 018-00
Skill Rating 2
Diagram? no
Answer: B

USNA Accepts ____
Ques. Proofed TA

6-1.2 A flywheel of radius 0.5 ft is rotating at a constant speed of 2500 rpm (rev/min). The tangential velocity of a point on the rim will be, in ft/sec

A. 1250

B. 625

C. 524

D. 131

ID# 6-1.2
T.O.# 018-00
Skill Rating 2
Diagram? no
Answer: D

USNA Accepts ____
Ques. Proofed TA
Ques. Xeroxed

6-1.3 A flywheel is rotating at a constant speed of 1200 rpm (rev/min). The tangential velocity of a point on the rim of the flywheel is 31.4 m/sec. The radius of the flywheel is, in meters

A. 4.00

B. 1.57

C. 0.639

D. 0.250

ID# 6-1.3
T.O.# 018-00
Skill Rating 2
Diagram? no
Answer: D

USNA Accepts ____
Ques. Proofed TA
Ques. Xeroxed____
Diagram Made____
Diagram OK ____
Diagram Xerox____
To NYIT ____
To Computer

6-1.4 A flywheel is rotating at a constant speed of 4000 rpm (rev/min). The tangential velocity of a point on the rim of the flywheel is 314 ft/sec. The radius of the flywheel is, in ft

A. 2.37

B. 1.33

C. 0.750

D. 0.0785

ID# 6-1.4

T.O.# 018-00

Skill Rating 2

Diagram? no

Answer: C

USNA Accepts ___

Ques. Proofed TA

Ques. Xeroxed

6-1.5 A flywheel of radius 0.25m is rotating at a constant speed. The tangential velocity of a point on the rim is 78.6 m/sec. The angular velocity of the flywheel is, in rpm (rev/min)

A. 131.5

B. 1256

C. 3000

D. 75,360

ID# 6-1.5

T.O.# 018-00

Skill Rating 2

Diagram? no

Answer: C

USNA Accepts ___

Ques. Proofed TA

Ques. Xeroxed___

6-2.1 A particle moves at constant speed in a circular path of radius 4m. The tangential velocity of the particle is 10 m/sec. The centripetal acceleration of the particle is, in m/sec$^2$

A. 400

B. 40

C. 25

D. 2.5

ID# 6-2.1

T.O.# 018-00

Skill Rating 1

Diagram? no

Answer: C

USNA Accepts ___

Ques. Proofed TA

Ques. Xeroxed___

Diagram Made___

Diagram OK ___

Diagram Xerox___

6-2.2 A particle moves at constant speed in a circular path of radius 0.25 meters. The angular velocity of the particle is 6 rad/sec. The centripetal acceleration of the particle is, in m/sec$^2$

A. 144
B. 24
C. 9
D. 1.5

ID# 6-2.2
T.O.# 018-00
Skill Rating 1
Diagram? no
Answer: C

================
USNA Accepts ____
Ques. Proofed TA
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____

6-2.3 A particle moves at a constant speed of 30/$\pi$ rev/sec in a circle of radius 0.25m. The centripetal acceleration of the particle is, in m/sec$^2$

A. 900
B. 240
C. 22.8
D. 15.0

ID# 6-2.3
T.O.# 018-00
Skill Rating 1
Diagram? no
Answer: A

================
USNA Accepts

6-2.4 A particle moves at a constant speed of 5 m/sec in a circular path. The centripetal acceleration of the particle is 50 m/sec$^2$ The radius of the circle is, in meters

A. 0.1
B. 0.5
C. 2
D. 10

ID# 6-2.4
T.O.# 018-00
Skill Rating 1
Diagram? no
Answer: B

================
USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox

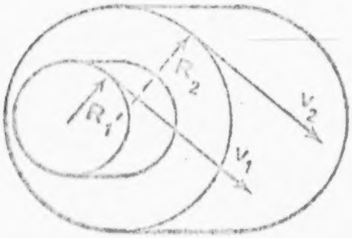
6-8.1 A flywheel consists of two concentric cylinders of radii $R_1$ and $R_2$ as shown. The flywheel is rotating at a constant angular velocity, ω. If $R_2 = 3 R_1$, the relationship between $V_2$ and $V_1$ is

A. $V_2 = 1/3\ V_1$

B. $V_2 = 3\ V_1$

C. $V_2 = V_1$

D. $V_2 = \sqrt{3\ V_1}$



ID# 6-8.1
T.O.# 018-11
Skill Rating 2
Diagram? yes
Answer: B

=================
USNA Accepts ____
Ques. Proofed SN
Ques. Xeroxed ____

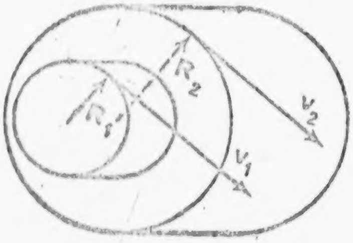
6-8.2 A flywheel consists of two concentric cylinders of radii $R_1$ and $R_2$ as shown. The flywheel is rotating at a constant angular velocity, ω. If $V_2 = 3\ V_1$ the relationship between $R_2$ and $R_1$ is

A. $R_2 = 9\ R_1$

B. $R_2 = 3.33\ R_1$

C. $R_2 = 3\ R_1$

D. $R_2 = \sqrt{3\ R_1}$



ID# 6-8.2
T.O # 018-11
Skill Rating 2
Diagram? yes
Answer: C

=================
USNA Accepts ____
Ques. Proofed SN
Ques. Xeroxed ____
Diagram Made

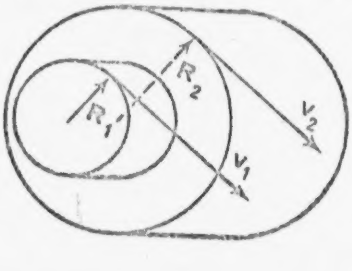
6-8.3 A flywheel consists of two concentric cylinders of radii $R_1$ and $R_2$ as shown. The flywheel is rotating at a constant speed of $\frac{10}{\pi}$ rev/sec. If $R_1 = 0.25$ ft and $R_2 = 0.75$ ft the magnitudes of $V_1$ and $V_2$ are, in ft/sec

A. $V_1 = 5$ ft/sec, $V_2 = 8.65$ t/sec

B. $V_1 = 5$ ft/sec, $V_2 = 15$ ft/sec

C. $V_1 = 80$ ft/sec, $V_2 = 138.4$ ft/sec

D. $V_1 = 80$ ft/sec, $V_2 = 240$/ftsec



ID# 6-8.3
T.O # 018-11
Skill Rating 2
Diagram? yes
Answer: B

=================
USNA Accepts ____
Ques. Proofed SN
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox

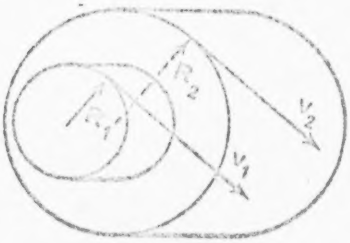
6-8.4 A flywheel consists of two concentric cylinders of radii $R_1$ and $R_2$ as shown. The flywheel is rotating at a constant speed of $\frac{30}{\pi}$ rev/sec. If $R_1 = 0.25$ ft and $R_2 = 0.33$ ft the magnitudes of $V_1$ and $V_2$ are, in ft/sec

A. $V_1 = 0.38$ ft/sec, $V_2 = 0.567$ ft/sec

B. $V_1 = 4.56$ ft/sec, $V_2 = 6.08$ ft/sec

C. $V_1 = 15$ ft/sec, $V_2 = 20$ ft/sec

D. $V_1 = 180$ ft/sec, $V_2 = 240$ ft/sec



ID# 6-8.4
T.O.# 018-11
Skill Rating 2
Diagram? yes
Answer: C

=================

USNA Accepts ____
Ques. Proofed SM
Ques. Xeroxed____
Diagram Made____
Diagram OK ____
Diagram Xerox____
To NYIT ____
To Computer____
OK Computer____
Answer Record____
NYIT, Fall 1970

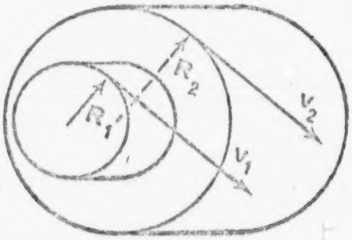
6-8.5 A flywheel consists of two concentric cylinders of radii $R_1$ and $R_2$ as shown. If $V_2 = 2\ V_1$ the relationship between $R_2$ and $R_1$ is

A. $R_2 = 5\ R_1$

B. $R_2 = 4\ R_1$

C. $R_2 = 2\ R_1$

D. $R_2 = 1.41\ R_1$



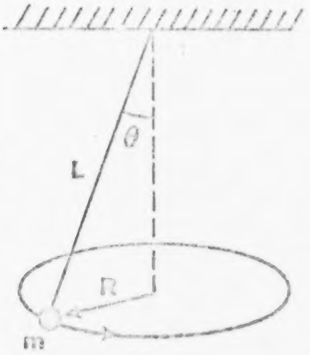
ID# 6-8.5
T.O.# 018-11
Skill Rating 2
Diagram? yes
Answer: C

=================

USNA Accepts ____
Ques. Proofed SM
Ques. Xeroxed____
Diagram Made____
Diagram OK ____
Diagram Xerox____
To NYIT ____
To Computer____
OK Computer____
Answer Record____
NYIT, Fall 1970

6-9.1 The figure shows a mass of 1 kg revolving in a horizontal circle. The mass is suspended from a string 1 m in length and the angle $\theta = 30°$. The time required for the mass to make one complete revolution is, in seconds

A. 1.87
B. 1.11
C. 1.03
D. 0.339

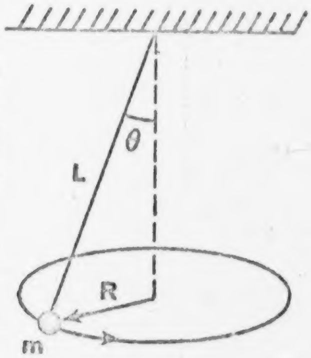


ID# 6-9.1
T.O.# 019-00
Skill Rating 2
Diagram? yes
Answer: A

USNA Accepts ___
Ques. Proofed SA
Ques. Xeroxed ___
Diagram Made ___
Diagram OK ___
Diagram Xerox ___
To NYIT ___
To Computer ___
OK Computer ___
Answer Record ___
NYIT, Fall 1970

6-9.2 The figure shows a mass of 2 kg revolving in a horizontal circle, at a constant speed of 2 m/sec. If it requires $\pi/2$ seconds for the mass to make one complete revolution, the angle which the string makes with the vertical ($\theta$) is, in degrees

A. 50.4
B. 39.2
C. 22.2
D. 14.0

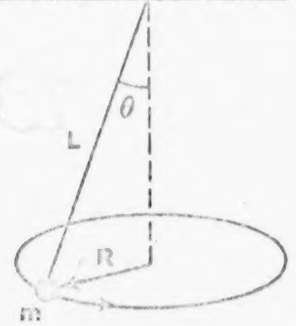


ID# 6-9.2
T.O.# 019-00
Skill Rating 2
Diagram? yes
Answer: B

USNA Accepts ___
Ques. Proofed SA
Ques. Xeroxed ___
Diagram Made ___
Diagram OK ___
Diagram Xerox ___
To NYIT ___
To Computer ___
OK Computer ___
Answer Record ___
NYIT, Fall 1970

6-9.3 The figure shows a mass of 0.5 kg revolving in a horizontal circle at a constant speed of 2 m/sec. If the string makes an angle of 37° with the vertical, the radius of the horizontal circle is, in meters.

A. 0.167
B. 0.273
C. 0.545
D. 1.83



ID# 6-9.3
T.O.# 019-00
Skill Rating 2
Diagram? yes
Answer: C

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

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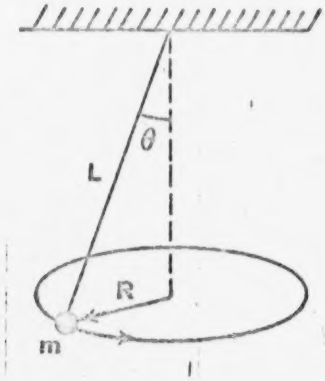
6-9.4 The figure shows a mass of 0.25 kg revolving in a horizontal circle at a constant speed of 3 m/sec. If the string makes an angle of 30° with the vertical (θ) the time required for one complete revolution is, in seconds

A. 1.04
B. 1.32
C. 2.05
D. 2.64



ID# 6-9.4
T.O.# 019-00
Skill Rating 2
Diagram? yes
Answer: D

USNA Accepts
Ques. Proofed 84
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

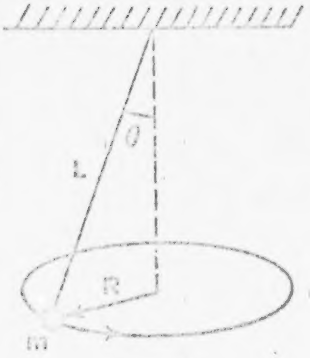
6-9.5 The figure shows a mass of 0.5 kg revolving in a horizontal circle at a constant speed of 3 m/sec. If the angle the string makes with the vertical ($\theta$) is 37° the length of the string (L) is, in meters

A. 2.04

B. 1.53

C. 1.23

D. 0.626



ID# 6-9.5

T.O.# 019-00

Skill Rating 2

Diagram? yes

Answer: A

USNA Accepts ____

Ques. Proofed SN

Ques. Xeroxed ____

Diagram Made ____

Diagram OK ____

Diagram Xerox ____

To NYIT ____

To Computer ____

OK Computer ____

Answer Record ____

NYIT, Fall 1970

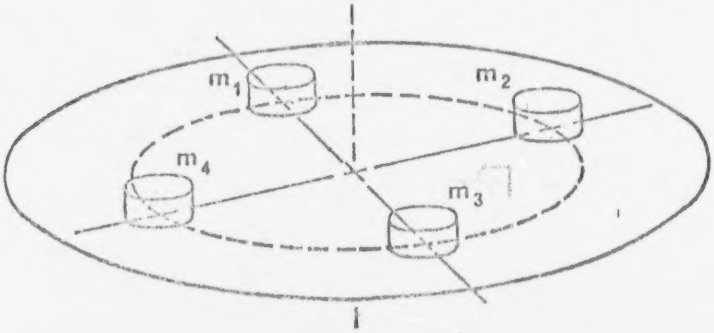
6-14.1 Four masses, $m_1$, $m_2$, $m_3$, and $m_4$ are placed 4 inches from the center of a phonograph turn-table (33 1/3 rpm) and the switch is turned on. The masses are such that: $m_2 = 2\ m_1$; $m_3 = 3\ m_1$ and $m_4 = 4\ m_1$. The coefficients of static and kinetic friction between each mass and the turn-table are 0.1 and 0.05 respectively. As the turn-table comes up to speed the order in which the masses will begain to slide is

A. $m_1$, $m_2$, $m_3$ and $m_4$

B. $m_4$, $m_3$, $m_2$ and $m_1$

C. All masses will slide at same instant

D. None of the masses will slide at or below 33 1/3 rpm.



ID# 6-14.1

T.O.# 019-00

Skill Rating 2

Diagram? yes

Answer: C

USNA Accepts ____

Ques. Proofed SN

Ques. Xeroxed ____

Diagram Made ____

Diagram OK ____

Diagram Xerox ____

To NYIT ____

To Computer ____

OK Computer ____

Answer Record ____

NYIT, Fall 1970

6-14.2 The radius of a circular unbanked highway curve is 400 ft. The minimum coefficient of friction between tires and road which will keep traffic from skidding at a speed of 40 miles/hr is

A. 0.125

B. 0.270

C. 0.430

D. 0.880

ID# 6-14.2
T.O.# 019-00
Skill Rating 2
Diagram? no
Answer: B

USNA Accepts ____
Ques. Proofed SW

6-14.3 The radius of a circular unbanked highway is 500 ft. Assuming a coefficient of friction of 0.25 between tires and road, the maximum speed at which traffic can round the curve without skidding is, in miles/hr

A. 16.3

B. 20

C. 43

D. 63

ID# 6-14.3
T.O.# 019-00
Skill Rating 2
Diagram? no
Answer: C

USNA Accepts ____
Ques. Proofed SW
Ques. Xeroxed

6-14.4 It is desired that traffic be able to round an unbanked highway curve at 60 miles/hr without skidding. Assuming a coefficient of friction of 0.25 between tires and road the minimum radius of the curve is, in feet

A. 1470

B. 968

C. 450

D. 315

ID# 6-14.4
T.O.# 019-00
Skill Rating 2
Diagram? no
Answer: B

USNA Accepts ____
Ques. Proofed SW
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____

6-14.5 It is found that traffic can just round, without skidding, an unbanked highway curve of radius 400 ft when traveling at a speed of 40 miles/hr. Assuming that the coefficient of friction between the tires and the road remains constant the maximum speed at which traffic can round an unbanked curve of radius 300 ft without skidding is, in miles/hr

A. 46
B. 34.3
C. 30
D. 10.9

ID# 6-14.5
T.O.# 019-00
Skill Rating 2
Diagram? no
Answer: B

USNA Accepts ____
Ques. Proofed SN
Ques. Xeroxed ____

6-15.1 A man plans to perform the loop-the-loop stunt on a motorcycle at a county fair. If the radius of the loop is 30 ft the minimum speed which the motorcycle must have at the top of the loop is, in ft/sec

A. 98
B. 52.2
C. 31
D. 27.4

ID# 6-15.1
T.O.# 019-00
Skill Rating 2
Diagram? no
Answer: C

USNA Accepts ____
Ques. Proofed SN
Ques. Xeroxed ____
Diagram Made

6-15.2 A mass of 0.5 kg rests in a pail which is moved in a vertical circle of radius 2 m. The minimum speed the mass must have at the top so as not to fall out is, in m/sec

A. 8
B. 4.9
C. 4.42
D. 4

ID# 6-15.2
T.O.# 019-00
Skill Rating 2
Diagram? no
Answer: C

USNA Accepts ____
Ques. Proofed SN
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox

6-15.3 A mass of 1 slug rests in a pail which is moved in a vertical circle of radius 3 ft. The minimum speed the mass must have at the top so as not to fall out is, in ft/sec

A. 17.1
B. 9.8
C. 5.4
D. 3.1

ID# 6-15.3
T.O.# 019-00
Skill Rating 2
Diagram? no
Answer: B

================
USNA Accepts ___
Ques. Proofed SN

6-15.4 A mass of 0.5 slug rests in a pail which is moved in a vertical circle at a constant speed of 8 ft/sec. The maximum radius the circle can have so that the mass will not fall out at the top is, in ft

A. 0.25
B. 0.50
C. 2.00
D. 6.50

ID# 6-15.4
T.O.# 019-00
Skill Rating 2
Diagram? no
Answer: C

================
USNA Accepts ___
Ques. Proofed SN
Ques. Xeroxed ___

6-15.5 Two masses, $m_1$ and $m_2 = 2\,m_1$, rest in a pail which is moved in a vertical circle of radius 3 ft. The speed of the bucket at the top of the circle is 12 ft/sec. At the top of the circle:

A. only $m_1$ will fall out
B. only $m_2$ will fall out
C. both $m_1$ and $m_2$ will fall out
D. neither $m_1$ or $m_2$ will fall out

ID# 6-15.5
T.O.# 019-00
Skill Rating 2
Diagram? no
Answer: D

================
USNA Accepts ___
Ques. Proofed SN
Ques. Xeroxed ___
Diagram Made ___
Diagram OK ___
Diagram Xerox ___
To NYIT ___

6-16.1 A circular curve of highway is designed for traffic moving at 60 miles/hr. If the radius of the curve is 500 ft the correct angle of banking of the road is, in degrees

A. 25.9

B. 57.8

C. 64.1

D. 66

ID# 6-16.1
T.O.# 019-00
Skill Rating 2
Diagram? no
Answer: A

6-16.2 A circular curve of highway is designed for traffic moving at 40 miles/hr. If the radius of the curve is 400 ft the correct angle of banking of the road is, in degrees

A. 41.3

B. 22.1

C. 15.1

D. 7.15

ID# 6-16.2
T.O.# 019-00
Skill Rating 2
Diagram? no
Answer: C

6-16.3 A circular curve of highway is designed for traffic moving at 50 miles/hr. If the road is banked at an angle of 18.6° the radius of the curve is, in feet

A. 1630

B. 759

C. 500

D. 232

ID# 6-16.3
T.O.# 019-00
Skill Rating 2
Diagram? no
Answer: C

6-16.4 A circular curve of highway of radius $R_o$ is designed for traffic moving at a speed of $V_o$. If the angle at which the road is banked is kept constant, and the traffic is to move at a speed of $V = 2\ V_o$ the new radius R must be

A. $R_o^2$

B. $4\ R_o$

C. $2\ R_o$

D. $\sqrt{2}\ R_o$

ID# 6-16.4
T.O.# 019-00
Skill Rating 2
Diagram? no
Answer: B

USNA Accepts
Ques. Proofed

6-16.5 A circular curve of highway of radius $R_o$ is designed for traffic moving at 60 miles/hr. Assuming that the angle at which the road is banked remains constant but the new radius $R = R_o/2$. The maximum speed at which traffic can move is, in miles/hr.

A. 84.6

B. 42.4

C. 30

D. 15

ID# 6-16.5
T.O.# 019-00
Skill Rating 2
Diagram? no
Answer: B

USNA Accepts
Ques. Proofed [illegible]

7-1.1 The centripetal force does positive work on a particle if the particle is moving in an eliptical path.

☐ True ☐ False

ID# 7-1.1
T.O.# 020-00
Skill Rating 0
Diagram? no
Answer: False

7-1.2 The centripetal force does no work on a particle moving in circular motion only if the velocity is constant.

☐ True ☐ False

ID# 7-1.2
T.O.# 020-00
Skill Rating 0
Diagram? no
Answer: False

7-1.3 If the centripetal acceleration of a particle is increasing it means that the centripetal force is doing positive work on the particle.

☐ True ☐ False

ID# 7-1.3
T.O.# 020-00
Skill Rating 0
Diagram? no
Answer: False

7-1.4 No work is done, by the centripetal force, on a particle which moves along a curved path in the shape of an S.

☐ True ☐ False

ID# 7-1.4
T.O.# 020-00
Skill Rating 0
Diagram? no
Answer: True

7-1.5 The work done by the centripetal force on a particle moving along a curved path is always zero regardless of the shape of the curved path.

☐ True ☐ False

ID# 7-1.5
T.O.# 020-00
Skill Rating 0
Diagram? no
Answer: True

7-2.1 A student picks up a 2 lb book from atop a table 3 ft high and moves it across the room, a distance of 10 ft and places it on a shelf 7 ft high. How much work does the student do on the book?

W = ________

ID# 7-2.1
T.O.# 020-00
Skill Rating 1
Diagram? no
Answer: 8 ft lb

USNA Accepts ____
Ques. Proofed S✓
Ques. Xeroxed ____

7-2.2 A midshipman takes a 5 lb chair from the floor and sits it atop a 3 ft table which is 5 ft away. What is the work done on the chair by the midshipman?

W = ________

ID# 7-2.2
T.O.# 020-00
Skill Rating 1
Diagram? no
Answer: 15 ft lb

7-2.3 A safe having a mass of 3 slugs is raised to the third story window from the ground 27 ft below. How much work is done on the safe?

w = ________

ID# 7-2.3

T.O.# 020-00

Skill Rating 1

Diagram? no

Answer: 2592 ft l

(range: 2560 to 2620 ft lb)

7-2.4 A briefcase full of books weighs 15 lbs. You carry the briefcase 100 yards up a hill to a spot which is 20 ft above the starting point. How much work is done on the briefcase?

w = ________

ID# 7-2.4

T.O.# 020-00

Skill Rating 1

Diagram? no

Answer: 300 ft lb

7-2.5 An athelete wears a 2 lb weight around each ankle while in training. How much work does the athelete do on the weights as he runs one time around a 400 yard track?

w = ______

ID# 7-2.5

T.O.# 020-00

Skill Rating 1

Diagram? no

Answer: 0

================

7-5.1 A force F = -kx where x is the displacement acts on a particle of mass m = 3 kg. The work done on the particle as it moves from x = 2.0 to x = 1.0 meter is 9.0 joules. What is the valve (including units) of the constant k?

k = ________

ID# 7-5.1

T.O.# 021-00

Skill Rating 1

Diagram? no

Answer: 6 kg/sec

================

USNA Accepts ____

Ques. Proofed SN

Ques. Xeroxed____

7-5.2 A force $F = a + bx$ where a and b are constants acts on a particle of mass $m = 3$ kg. The work done by the force as the particle moves from $x = 0$ to $x = 2.0$ meters is 6.0 joules, and from $x = 2.0$ meter to $x = 4.0$ meters is 18.0 joules. What is the valve of the constants a and b?

a = ______

b = ______

ID# 7-5.2
T.O.# 021-00
Skill Rating 1
Diagram? no
Answer:
a = 0
b = 3 $kg/sec^2$
==============
USNA Accepts ____

7-5.3 A particle of mass $m = 2$ kg has a force $F = \frac{k}{x^2}$ acting on it where x is the displacement and the constant $k = 10\ kg\ m^3/sec^2$. What is the work done by the force as the particle moves from $x = 0.5$ meter to $x = 1.0$ meter?

w = ______

ID# 7-5.3
T.O.# 021-00
Skill Rating 1
Diagram? no
Answer: 10 joules

7-5.4 A force $F = ax - bx^3$ acts on a particle of mass $m = 5$ kg, where x is the displacement and the constants $a = 5\ kg/sec^2$ and $b = 10\ kg^{-2}/sec^{-2}$. What is the work done by the force as the particle moves from $x = 2$ meters to $x = 1$ meter?

w = ______

ID# 7-5.4
T.O.# 021-00
Skill 1
Diagram? no
Answer:
30 joules
==============

7-5.5 A constant force of 5.0 nt acts on a particle of mass $m = 2.5$ kg in the direction of the motion of the particle. What work is done by the force as the particle moves from $x = 1.0$ meter to $x = 5.0$ meters if the velocity of the particle is kept constant?

w = ______

ID# 7-5.5
T.O.# 021-00
Skill 1
Diagram? no
Answer:
20 joules
==============
USNA Accepts ____

7-9.1 A block of mass m = 10 kg hangs in equilibrium on a spring of spring constant 980 nt/m which is fixed to the ceiling. An external force applied to the block causes it to rise to a position 5 centimeters above the equilibrium position. What work is done by the spring?

w = ____________

ID# 7-9.1

T.O.# 021-00

Skill 2

Diagram? no

Answer: 3.68 joules

(range: 3.65 to 3.71 joules)

==============

USNA Accepts ____

7-9.2 A 20-kg block is placed on top a spring causing the spring to compress. When the block is in equilibrium with the spring in the compressed position what work has been done by the spring? The spring constant $k = 490\ \text{kg/sec}^2$.

w = ____________

ID# 7-9.2

T.O.# 021-00

Skill 2

Diagram? no

Answer: -39.2 joules

(range: 38.9 to 39.5 joules)

7-9.3 A spring of constant k = 100 lb/ft is fixed to the ceiling. A weight is fixed to the spring and allowed to stretch the spring to its new equilibrium position. The work done by the spring was -12.5 ft-lb. What is the weight fixed to the spring?

w = ____________

ID# 7-9.3

T.O.# 021-00

Skill 2

Diagram? no

Answer: 50 lb.

7-9.4 A 32-lb block lying on a table has a spring with constant k = 600 lb/ft attached. The other end of the spring is fixed to the wall. An external force causes the block to move from the equilibrium position to a position 12 inches away. What is the work done by the spring as the block moves from 4 inches to 8 inches from the equilibrium position?

w = ____________

ID# 7-9.4

T.O.# 021-00

Skill 1

Diagram? no

Answer: -100 ft-lb

==============

USNA Accepts ____

7-9.5 A block of mass 5 kg fixed to a horizontal spring with spring constant k = 350 lb/ft lies on a frictionless table. With the spring unstretched the block is at position $x = 20$ inches. What work will the spring do if an outside force causes the block to move from $x_1 = 16$ inches to $x_2 = 26$ inches?

W = ________

ID# 7-9.5
T.O.# 021-00
Skill 1
Diagram? no
Answer: -25 ft-lb

===============
USNA Accepts ____
Ques. Proofed SH
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____

7-10.1 What horsepower must an electric motor deliver to a hoist if it is to lift a 330 lb crate vertically at a constant velocity of 5 ft/sec?

A. 3
B. 0.5
C. 2
D. 5

ID# 7-10.1
T.O.# 022-00
Skill 1
Diagram? no
Answer: A

===============
USNA Accepts ____

7-10.2 You wish to design an escalator that will carry 32 passengers, with an average weight of 160 lbs, at a constant velocity of 3 ft/sec. If you neglect friction, what is the maximum angle of inclination above the horizontal the escalator can have? You are limited to a 12 hp motor.

A. 65°
B. 64°
C. 26°
D. 25°

ID# 7-10.2
T.O.# 022-00
Skill Rating 1
Diagram? no
Answer: D

===============
USNA Accepts ____
Ques. Proofed SH
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____

7-10.3 If internal friction and air resistance could be neglected, an automobile engine going up a hill would only have to overcome the weight of the car. What horsepower would an engine have to deliver to maintain a constant velocity of 60 mi/hr up a 30° incline if the car weighs 4120 lbs?

A. 22.5

B. 33

C. 57

D. 66

ID# 7-10.3

T.O.# 022-00

Skill Rating 1

Diagram? no

Answer: B

USNA Accepts ____

Ques. Proofed ____

Ques. Xeroxed ____

Diagram Made ____

Diagram OK ____

Diagram Xerox ____

To NYIT

7-10.4 A helicopter is used to pick up pilots downed at sea. An electric motor delivers 2.0 hp to a sling hoist. At what maximum velocity will it retrieve a 200 lb pilot?

A. 2.75 ft/sec

B. 5.5 ft/sec

C. 1.375 ft/sec

D. 33 ft/sec

ID# 7-10.4

T.O.# 022-00

Skill Rating 1

Diagram? no

Answer: B

USNA Accepts ____

7-10.5 A 2000 lb elevator has a motor that can deliver a maximum power of 24 hp. If the elevator is moving with a constant speed of 3 ft/sec, what is the maximum number of passengers, with an average weight of 155 lbs, can the elevator handle?

A. 2

B. 15

C. 16

D. 20

ID# 7-10.5

T.O.# 022-00

Skill Rating 1

Diagram? no

Answer: B

USNA Accepts ____

Ques. Proofed ____

Ques. Xeroxed ____

Diagram Made ____

7-15.1 A 10 gram bullet fired into the air at an initial velocity of 300 m/sec. When the bullet reaches its highest altitude, its kinetic energy is zero. At what angle above the horizontal was the bullet fired?

$\theta$ = ________

ID# 7-15.1

I.O.# 023-00

Skill Rating 1

Diagram? no

Answer: 90°

7-15.2 A 5-kg particle projected into the air with an initial velocity of 20 m/sec had a kinetic energy of 250 joules when it reaches its highest altitude. At what angle above the horizon was the particle initially projected?

$\theta$ = ________

ID# 7-15.2

I.O.# 023-00

Skill Rating 1

Diagram? no

Answer: 60°

================

USNA Accepts

7-15.3 A particle has a kinetic energy of 450 joules as it is projected into the air with a velocity of 15 m/sec at an angle of 30° above the horizontal. What is the mass of the particle?

m = ________

ID# 7-15.3

I.O.# 023-00

Skill Rating 1

Diagram? no

Answer: 4 kg

================

7-15.4 A particle of mass m = 2 kg is projected into the air at an angle of 60° above the horizontal. When the particle reaches its maximum altitude it has a kinetic energy of 25 joules. What was the kinetic energy when the particle was initially projected?

K = ________

ID# 7-15.4

I.O.# 023-00

Skill Rating 1

Diagram? no

Answer: 100 joule

================

7-15.5 A particle has a velocity of 25 m/sec. If its kinetic energy is increased by a factor of four, what is the new velocity? Assume a constant mass.

v = ________

ID# 7-15.5
I.O # 023-00
Skill Rating 1
Diagram? no
Answer: 50 m/sec

USNA Accepts

7-18.1 A 2 kg block is released from rest on a frictionless inclined plane. What is the velocity of the block when the vertical component of its displacement is 2.5 m down?

v = ________

ID# 7-18.1
I.O # 023-00
Skill Rating 1
Diagram? no
Answer: 7 m/sec
(range: 6.95 to 7.05 m/sec

7-18.2 A particle of mass 3.0 kg is projected vertically upward with an initial velocity of 20 m/sec. What is the kinetic energy when the particle is 20 meters above the initial position?

K = ________

ID# 7-18.2
I.O # 023-00
Skill Rating 1
Diagram? no
Answer: 12 joules
(range: 9.0 to 15.0 joules)

7-18.3 A particle is thrown vertically downward from atop a tall building. The initial velocity is 50 ft/sec. What is the velocity after the particle has traveled 50 ft?

v = ________

ID# 7-18.3
I.O # 023-00
Skill Rating 1
Diagram? no
Answer: ________
75.5 ft/sec
(range: 75.0 to 76.0 ft/sec)

USNA Accepts ____
Ques. Proofed

7-18.4 A 16 lb block sliding on a plane has a velocity of 30 ft/sec when it passes point A and a velocity of 10 ft/sec when it passes point B which is 50 ft from point A. What is the magnitude of the resultant force on the block?

|F| = ________

ID# 7-18.4
I.O.# 023-00
Skill Rating 1
Diagram? no
Answer: 4 lb

USNA Accepts ____
Ques Proofed SN
Ques Xeroxed ____
Diagram Made

7-18.5 A 30 lb block is given an initial velocity of 32 ft/sec down a plane inclined at an angle of 30° with the horizontal. The resultant force on the block is 4 lb up the plane. What is the kinetic energy of the block after it has moved 20 ft down the plane.

K = ________

ID# 7-18.5
I.O.# 023-00
Skill Rating 1
Diagram? no
Answer: ____
400 ft-lb

USNA Accepts

7-24.1 An 8 lb block moves initially on a frictionless section of a plane at a velocity of 32 ft/sec. The block must cross a section of the plane which has a coefficient of kinetic friction $\mu_k = 0.2$ and is 20 ft wide. It then goes up a frictionless plane inclined at an angle of 30° with the horizontal. What is the distance from the bottom of the incline to the point where the block will stop?

s = ________

ID# 7-24.1
I.O.# 023-00
Skill Rating 2
Diagram? no
Answer: 24 ft

USNA Accepts ____
Ques. Proofed SN
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer

7-24.2 A 16 lb block released from rest on a frictionless plane inclined at an angle of 30° with the horizontal. The block moves 17 ft down the frictionless plane where it then is on a horizontal friction plane with a coefficient of kinetic friction $\mu_k = 0.25$. What is the velocity of the block after it has moved a distance of 30 ft on the friction plane?

v = ________

ID# 7-24.2

T.O.# 023-00

Skill Rating 2

Diagram? no

Answer: 8 ft/s

USNA Accepts ____

Ques. Proofed SN

Ques. Xeroxed ____

7-24.3 A 24 lb block has an initial kinetic energy of 192 ft-lb on a horizontal plane with a coefficient of kinetic friction $\mu_k = 0.2$ where it moves a distance of 20 ft before starting down a 10 ft long frictionless plane inclined at an angle of 30° with the horizontal. The block then moves on to a horizontal friction plane, $\mu_k = 0.3$, where it comes to rest. How far does it move on this horizontal plane before it comes to rest?

s = ________

ID# 7-24.3

T.O.# 023-00

Skill Rating 2

Diagram? no

Answer: 30 ft

USNA Accepts ____

Ques. Proofed SN

Ques. Xeroxed ____

Diagram Made

7-24.4 A 4 ounce bullet fired with a speed of 800 ft/sec passes through a telephone pole 12 inches in diameter at a point 4 ft above the ground. The bullet's path through the pole is horizontal and along a diameter. While in the pole the bullet experiences an average force of 1250 lbs. If air resistance is neglected, at what horizontal distance from the pole will the bullet hit the ground?

x = ________

ID# 7-24.4

T.O.# 023-00

Skill Rating 2

Diagram? no

Answer: 282.5 ft
(range: 278 to
287 ft)

USNA Accepts ____

Ques. Proofed SN

Ques. Xeroxed ____

Diagram Made ____

Diagram OK

7-24.5 A 2 ounce bullet is fired so it will pass horizontally through a telephone pole, 12 inches in diameter at a point 4 ft above the ground. The bullet's path through the pole is horizontal and along a diameter. While in the pole the bullet experiences an average force of 1000 lbs. The bullet strikes the ground at a point 300 ft from the pole. What was the velocity of the bullet just prior to striking the pole?

x = ______

ID# 7-24.5

T.O.# 021-00

Skill Rating 2

Diagram? no

Answer: 783 ft/

(range: 763 to 793 ft/sec)

USNA Accepts ____

Ques. Proofed S/
Ques. Xeroxed ____

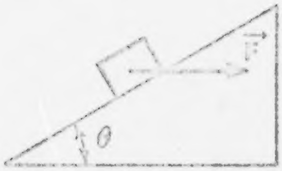
Diagram Made ____
Diagram OK ____
Diagram Xerox ____

To NYIT ____
To Computer ____
OK Computer ____

Answer Record ____

NYIT, Fall 1970

7-27.1



A constant horizontal force $\vec{F}$, of magnitude 100 nt, is used to move a 5-kg block up a plane inclined at an angle $\theta = 30°$ from the horizontal. If the block starts from rest and the coefficient of kinetic friction between the block and the plane is 0.20, how far must the block travel to have a speed of 10.0 m/sec?

A. 5.73 m

B. 4.80 m

C. 4.03 m

D. 3.67 m

ID# 7-27.1

T.O.# ____

Skill Rating ____

Diagram? yes

Answer: A

USNA Accepts ____

Ques. Proofed ____
Ques. Xeroxed ____

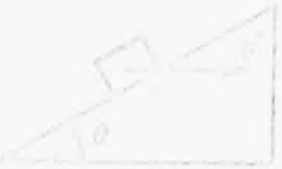
Diagram Made ____
Diagram OK ____
Diagram Xerox ____

To NYIT ____
To Computer ____
OK Computer ____

Answer Record ____

NYIT, Fall 1970

7-27.2



A constant horizontal force, $\vec{F}$, is used to move a 4-kg block up a plane inclined at an angle $\theta = 30°$ from the horizontal. The coefficient of kinetic friction between the block and the plane is 0.25. The block starting from rest obtains a velocity of 3 m/sec after it has moved a distance of 4.5 m along the plane. What is the magnitude of the force $\vec{F}$?

A. 45.2 nt

B. 55.1 nt

C. 60.5 nt

D. 123 nt

ID# 7-27.2

T.O.#

Skill Rating

Diagram?

Answer:

USNA Accepts

Ques. Proofed

Ques. Xeroxed

Diagram Made

Diagram OK

Diagram Xerox

To NYIT

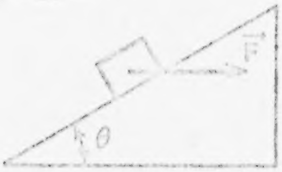
To Computer

OK Computer

Answer Record

NYIT, Fall 1970

7-27.3



A constant horizontal force, $\vec{F}$, of magnitude 100 nt, is used to move a block with a weight of 25 nt up a plane inclined at an angle $\theta = 60°$ with the horizontal. If the block starts from rest and acquires a velocity of 4 m/sec after it has moved 1.25 meters along the plane, what is the coefficient of friction between the block and the plane?

A. .218

B. .236

C. .270

D. .286

E. .474

ID# 7-2 .3

T.O.# 027-00

Skill Rating 2

Diagram? yes

Answer: B

USNA Accepts

Ques. Proofed

Ques. Xeroxed

Diagram Made

Diagram OK

Diagram Xerox

To NYIT

To Computer

OK Computer

Answer Record

NYIT, Fall 1970

7-27.4

A constant horizontal force, F, of magnitude 120 lb is used to move a 100 lb block up a plane inclined at 37° from the horizontal. If the block starts from rest, and the coefficient of kinetic friction between the block and the plane is 0.200, what is the speed of the block after it has traveled 10 ft along the plane?

A. 20.4 ft/sec

B. 11.8 ft/sec

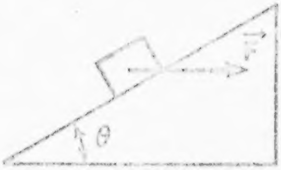
C. 11.5 ft/sec

D. 5.98 ft/sec

ID# 7-27.4
T.O.#
Skill Rating
Diagram? yes
Answer: B

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

7-27.5



A constant horizontal force, $\vec{F}$, of magnitude 150 lb, is used to move a 100 lb block up a plane inclined at an angle $\theta = 45°$ from the horizontal. If the block starts from rest and the coefficient of kinetic friction between the block and the plane is 0.10, how far must the block travel to obtain a speed of 10.0 ft/sec?

A. 11.1 ft

B. 8.89 ft

C. 6.33 ft

D. 5.55 ft

E. 4.43 ft

ID# 7-27.5
T.O.#
Skill Rating
Diagram? yes
Answer: B

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

8-1.1 If the total energy of the particle is conserved, the work done by the resultant conservative force is equal to the change in potential energy of the particle, $W = \Delta U$.

☐ True ☐ False

ID# 8-1.1

T.O.# 025-00

Skill Rating 0

Diagram? no

Answer: [illegible]

USNA Accepts ____

Ques. Proofed SH

Ques. Xeroxed ____

8-1.2 If the total energy of the particle is conserved, the work done by the resultant conservative force is equal to the negative of the change in potential energy of the particle, $W = -\Delta U$.

☐ True ☐ False

ID# 8-1.2

T.O.# 025-00

Skill Rating 0

Diagram? no

Answer: True

USNA Accepts ____

Ques. Proofed SH

Ques. Xeroxed ____

Diagram Made

8-1.3 If the total energy of the particle is conserved, the work done by the resultant conservative force is equal to the negative of the change in the total energy of the particle, $W = -\Delta E$.

☐ True ☐ False

ID# 8-1.3

T.O.# 025-00

Skill Rating 0

Diagram? no

Answer: False

USNA Accepts ____

Ques. Proofed SH

Ques. Xeroxed ____

Diagram Made -

Diagram OK ____

8-1.4 If the total energy of the particle is conserved, the work done by the resultant conservative force is equal to the negative of the change in kinetic energy of the particle, W = -ΔK.

☐ True ☐ False

ID# 8-1.4
T.O.# 0[illegible]
Skill Rating 0
Diagram? no
Answer: [illegible]

8-1.5 If the total energy of the particle is conserved, the work done by the resultant conservative force is equal to the change in kinetic energy of the particle, W = ΔK.

☐ True ☐ False

ID# 8-1.5
T.O.# 026-00
Skill Rating 0
Diagram? no
Answer: True

USNA Accepts ____
Ques. Proofed SH
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____

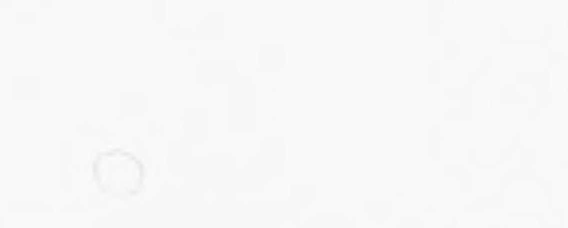
8-5.1 A roller coaster moves at point "A" with speed $V_o$. At point "B" the coaster moves with speed $2\ V_o$. Assuming no frictional losses, what is the height of point "A" above point "B"?

A. $3\ V_o^2/2g$

B. $5\ V_o^2/2g$

C. $V_o^2/2g$

D. $2\ V_o^2/g$



ID# 8-5.1
T.O.# 027-00
Skill Rating 1
Diagram? yes
Answer: A

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____

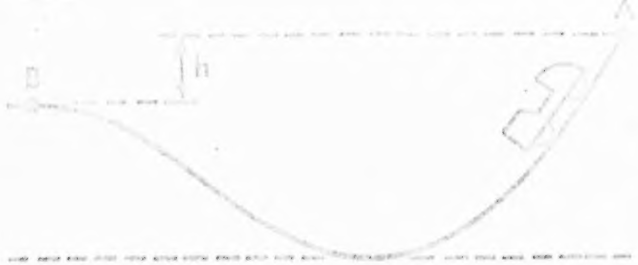
8-5.2 A roller coaster moves with speed $V_o$ at point "B". Point "A" is a height "h" above point "B". Assuming no frictional losses what is the speed at point "A"?

A. $V_o-2gh$

C. $V_o+\sqrt{2gh}$

B. $\sqrt{V_o^2-2gh}$

D. $\sqrt{V_o^2+2gh}$



ID# 8-5.2
T.O.# 027-00
Skill Rating 1
Diagram? yes
Answer: B

USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____
Diagram Made____
Diagram OK ____
Diagram Xerox____
To NYIT ____
To Computer____
OK Computer____
Answer Record____
NYIT, Fall 1970

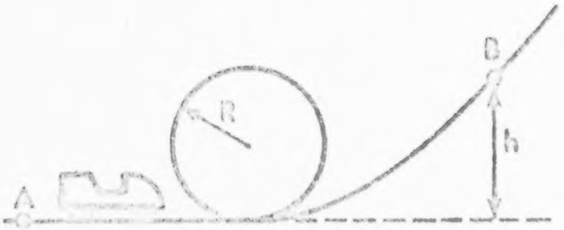
8-5.3 A roller coaster moves with a speed of $V_o$ at "A". It goes through the loop and up the incline. The kinetic energy at at "B" is one-half that at "A". What is the height of point "B" above point "A"? Assume no frictional losses.

A. $3\ V_o/4g$

C. $3\ V_o^2/8g$

B. zero

D. $V_o^2/4g$



ID# 8-5.3
T.O.# 027-00
Skill Rating 1
Diagram? yes
Answer: D

USNA Accepts ____
Ques. Proofed____
Ques. Xeroxed____
Diagram Made____
Diagram OK ____
Diagram Xerox____
To NYIT ____
To Computer____
OK Computer____
Answer Record____
NYIT, Fall 1970

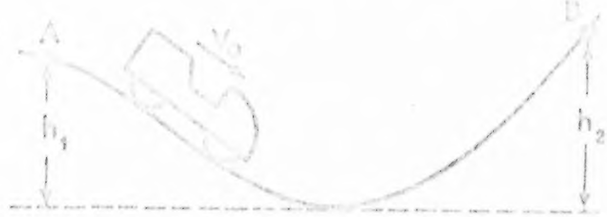
8-5.4 A roller coaster moves at point "A", a height of $h_1$ above the ground, with a speed of $V_o$. It moves to point "B" where it stops and starts to roll back down the incline. What is the height, $h_2$, of point "B" above the ground? Assume no frictional losses.

A. $\frac{V_o^2+2gh_1}{2g}$

B. $\frac{V_o^2}{2g}$

C. $2h_1$

D. $\frac{V_o^2}{2g} - h_1$



ID# 8-5.4
T.O.# [illegible]
Skill Rating 1
Diagram? yes
Answer: [illegible]

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

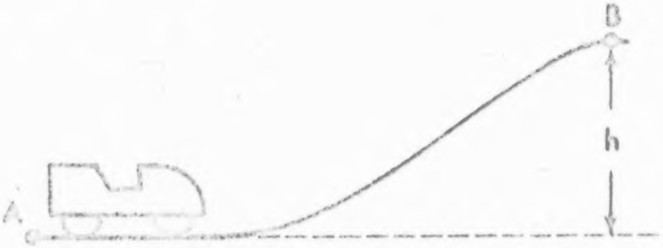
8-5.5 Assuming no friction involved, what must be the speed of the roller coaster at point "A" if it is to just barely reach point "B" before stopping, if "B" is a height, h, above "A".

A. $\frac{1}{2}gh$

B. $(2gh)^2$

C. $2gh$

D. $\sqrt{2gh}$



ID# 8-5.5
T.O.# 027-00
Skill Rating 1
Diagram? yes
Answer: D

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

8-9.1 A particle located at an arbitrary position, x, has a potential energy $U(x) = \frac{1}{2}kx^2$ where k is a constant. What is the force which acts on the particle?

$F(x) =$ ____________

ID# 8-9.1

T.O.# 026-00

Skill Rating 1

Diagram? no

Answer: ____

USNA Accepts ____

Ques. Proofed ____

Ques. Xeroxed ____

8-9.2 For a force $F = -kx$ acting on a particle where k is a constant, what is the change in potential energy as the particle moves from point $x_1$ to point $x_2 (x_2 > x_1)$.

$\Delta U =$ ____________

ID# 8-9.2

T.O.# 026-00

Skill Rating 1

Diagram? no

Answer: ____

$\frac{1}{2} k(x_2^2 - x_1^2)$

USNA Accepts ____

Ques. Proofed ____

Ques. Xeroxed ____

Diagram Made ____

8-9.3 For a force, $F = -3y$, acting on a particle, what is the potential energy of the particle when it is at position $y = -4$ if $u = 0$ for $y = 0$. Assume F in newtons and y in meters.

$U =$ ____________

ID# 8-9.3

T.O.# 026-00

Skill Rating 1

Diagram? no

Answer: ____

24 Joules

USNA Accepts ____

Ques. Proofed ____

Ques. Xeroxed ____

Diagram Made ____

Diagram OK

8-9.4 A conservative force of −5 newtons acts on a particle. What is the change in potential energy as the particle moves between points $y_1 = 7$ meters and $y_2 = 9$ meters?

$\Delta U =$ ________

ID# 8-9.4

T.O.# 025-00

Skill Rating 1

Diagram? no

Answer: ________

+10 Joules

8-9.5 A conservative force, $F = -4x^3$, acts on a particle. For a choice of potential energy equal zero for $x = 0$, what is the potential energy for $x = 3$? Assume F in newtons and x in meters.

U = ________

ID# 8-9.5

T.O.# 026-00

Skill Rating 1

Diagram? no

Answer: ________

81 Joules

================

USNA Accepts ____

Ques. Proofed ____
Ques. Xeroxed ____

Diagram Made ____
Diagram OK ____
Diagram Xerox ____

To NYIT ____

8-13.1 A ball of mass m is at rest on top of a spring with a spring constant k. If the length of the uncompressed spring is ℓ meters, what is the length of the compressed spring?

A. $\frac{2mg}{k}$

B. $\ell - \sqrt{\frac{2mg}{k}}$

C. $\ell - \sqrt{\frac{mg}{k}}$

D. $\ell^2 - \frac{2mg}{k}$

ID# 8-13.1

T.O.# 027-00

Skill Rating 1

Diagram? no

Answer: B

================

USNA Accepts ____

Ques. Proofed ____
Ques. Xeroxed ____

Diagram Made ____
Diagram OK ____
Diagram Xerox ____

To NYIT ____
To Computer

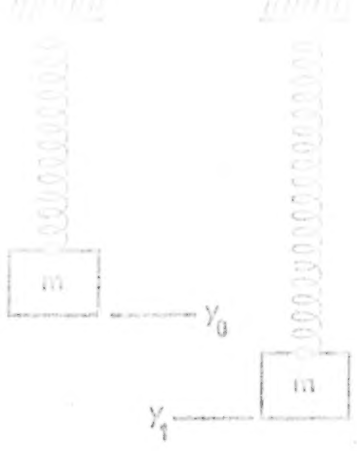
8-13.2 A block of mass m is attached to a spring with spring constant k and released from the neutral position $y_0$. What is the maximum elongation of the spring?

A. $\frac{ky_0^2}{2mg}$

C. $\sqrt{\frac{2mg}{k}}$

B. $\frac{ky_0^2}{2mg} - y_0$

D. $\frac{2mg}{k}$



ID# 8-13.2

I.C # 027-00

Skill Rating 1

Diagram? yes

Answer: ____

USNA Accepts ____

Ques. Proofed ____
Ques. Xeroxed ____

Diagram Made ____
Diagram OK ____
Diagram Xerox ____

To NYIT ____
To Computer ____
OK Computer ____

Answer Record ____

NYIT, Fall 1970

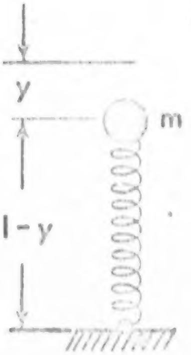
8-13.3 A spring of length ℓ and with spring constant k is compressed to a length of ℓ-y and tied with a string. A mass m is placed on top the spring then the string is cut. How high above the uncompressed spring will the mass m be tossed?

A. $\frac{ky^2}{2mg} - y$

C. $\frac{ky^2}{2mg} + y$

B. $\frac{ky^2}{mg} + y$

D. $\frac{ky^2}{mg} - y$



ID# 8-13.3

I.C # 027-00

Skill Rating 1

Diagram? yes

Answer: A

USNA Accepts ____

Ques. Proofed ____
Ques. Xeroxed ____

Diagram Made ____
Diagram OK ____
Diagram Xerox ____

To NYIT ____
To Computer ____
OK Computer ____

Answer Record ____

NYIT, Fall 1970

8-13.4 A block of mass m slides on a frictionless horizontal plane and compresses a spring with spring constant k a distance of x before it comes to rest. If the spring repels the block so that as it leaves the spring it has a velocity of

A. $\frac{kx}{m}$

C. $\frac{kx}{2m}$

B. $\sqrt{\frac{kx^2}{m}}$

D. $\sqrt{\frac{kx^2}{2m}}$

ID# 8-13.4
LO # 027-00
Skill Rating 1
Diagram? no
Answer: B

USNA Accepts ___
Ques. Proofed ___
Ques. Xeroxed ___
Diagram Made ___
Diagram OK ___
Diagram Xerox ___
To NYIT ___
To Computer ___
OK Computer ___
Answer Record ___
NYIT, Fall 1970

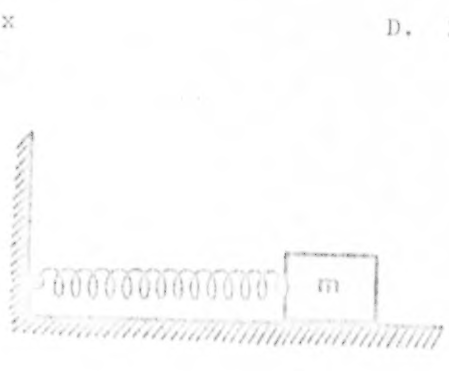
8-13.5 A mass is attached to the spring of length ℓ with spring constant k as shown. The spring is compressed to a length of ℓ - x then released. What will be the maximum displacement of the mass from the compressed position?

A. ℓ + 2x

C. ℓ + x

B. x

D. 2x

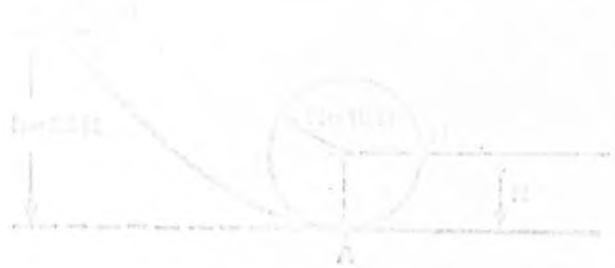


ID# 8-13.5
LO # 027-00
Skill Rating 0
Diagram? yes
Answer: D

USNA Accepts ___
Ques. Proofed ___
Ques. Xeroxed ___
Diagram Made ___
Diagram OK ___
Diagram Xerox ___
To NYIT ___
To Computer ___
OK Computer ___
Answer Record ___
NYIT, Fall 1970

8-18.1 A block of mass m is released from rest at a height of 25 ft on a frictionless track. The track contains a loop of 10 ft radius. What is the centripetal acceleration of the mass as it passes point B?

a = ________

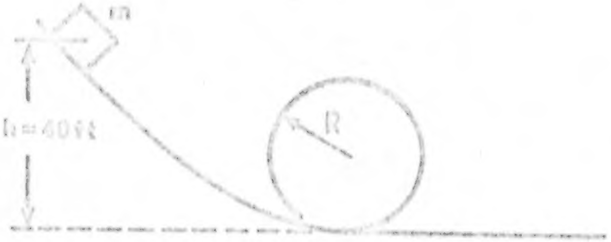


ID# 8-18.1
T.O.# 019-01
Skill Rating [illegible]
Diagram [illegible]
Answer: ________
a = 96 ft/s²

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

8-18.2 A block is released from a height of 40 ft. Compute the maximum valve of R in order that the block will go around the loop without loosing contact with the track. Assume a frictionless track.

R = ________

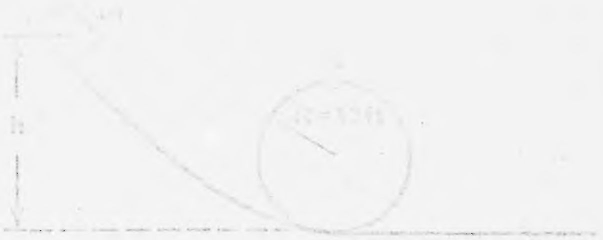


ID# 8-18.2
T.O.# 019-00
Skill Rating 2
Diagram? yes
Answer: 16 ft

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

8-18.3 From what height h must the mass m be released if it is to have a centripetal acceleration of 2.0g as it passes point [illegible] on the frictionless track?

h = ________

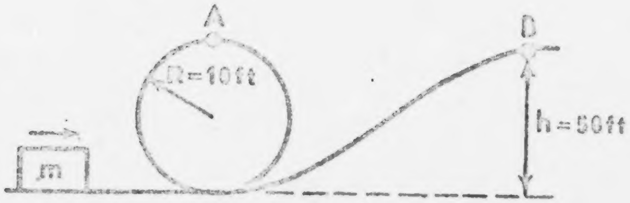


ID# 8-18.3
T.O.# 019-00
Skill Rating [illegible]
Diagram? yes
Answer: 30 ft

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

8-18.4 A block of mass m moves along a frictionless track containing a loop and a hill. What is the centripetal accelration at point "A" if the block will barely reach point "B" at the top of the hill?

a = ________

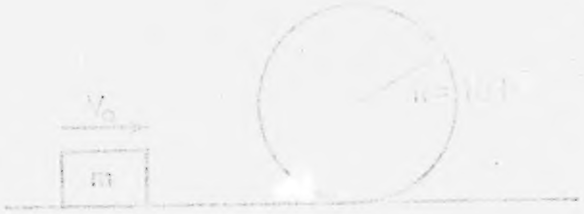


ID# 8-18.4
T.O.# 019-00
Skill Rating 2
Diagram? yes
Answer: ________
a = 192 ft/sec$^2$

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

[illegible] Compute the minimum velocity $V_0$ the mass m may have in order that it will go around the loop without losing contact with the track. Assume a frictionless track.

$V_0$ = ________



ID# [illegible]

T.O.# [illegible]

Skill Rating [illegible]

Diagram? [illegible]

Answer: ________

$V_0$ = 40 ft/sec

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USNA Accepts ____

Ques. Proofed____
Ques. Xeroxed____

Diagram Made____
Diagram OK ____
Diagram Xerox____

To NYIT ________
To Computer____
OK Computer____

Answer Record____

NYIT, Fall 1970

9-1.1

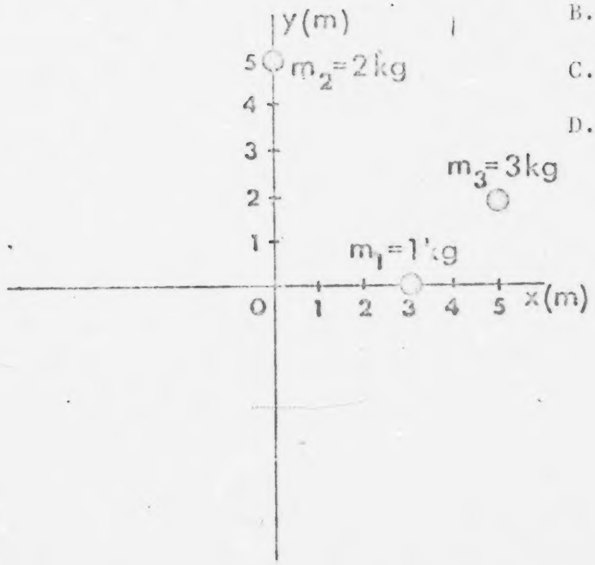
The coordinates of the center of mass of the system shown in the figure are, in meters

A. $\bar{x}_{cm} = +3$; $\bar{y}_{cm} = +2.67$

B. $\bar{x}_{cm} = +4.5$; $\bar{y}_{cm} = +3.2$

C. $\bar{x}_{cm} = +3$; $\bar{y}_{cm} = +3.2$

D. $\bar{x}_{cm} = +4.5$; $\bar{y}_{cm} = +2.67$



ID# 9-1.1

T.O.# 028-04

Skill Rating 2

Diagram? yes

Answer: A

================

USNA Accepts ____

Ques. Proofed ✓
Ques. Xeroxed____

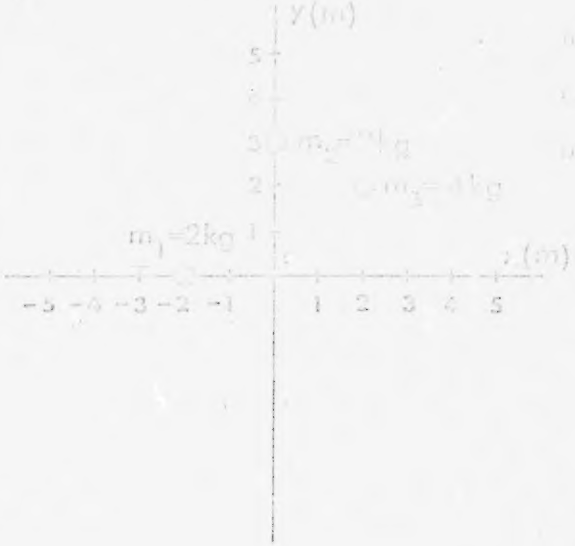
Diagram Made____
Diagram OK ____
Diagram Xerox____

To NYIT ________
To Computer____
OK Computer____

Answer Record____

NYIT, Fall 1970

9-1.2



The coordinates of the center of mass of the system shown in the figure are, in meters

A. $\overline{x}_{cm}$ = +1.52 $\overline{y}_{cm}$ = [illegible]

B. $\overline{x}_{cm}$ = +0.50; $\overline{y}_{cm}$ = +1.75

C. $\overline{x}_{cm}$ = +2.00; $\overline{y}_{cm}$ = [illegible]

D. $\overline{x}_{cm}$ = [illegible] $\overline{y}_{cm}$ = [illegible]

ID# 9-1.2

I.O.# [illegible]

Skill Rating ____

Diagram? yes

Answer: ____

USNA Accepts ____

Ques. Proofed ____
Ques. Xeroxed ____

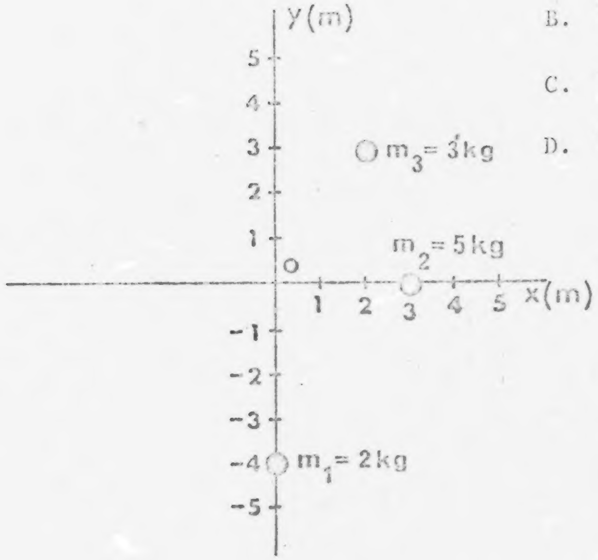
Diagram Made ____
Diagram OK ____
Diagram Xerox ____

To NYIT ____
To Computer ____
OK Computer ____

Answer Record ____

NYIT, Fall 1970

9-1.3



The coordinates of the center of mass of the system shown in the figure are, in meters

A. $\overline{x}_{cm}$ = +2.1; $\overline{y}_{cm}$ = +1.7

B. $\overline{x}_{cm}$ = +2.63; $\overline{y}_{cm}$ = +0.20

C. $\overline{x}_{cm}$ = +2.1; $\overline{y}_{cm}$ = +0.1

D. $\overline{x}_{cm}$ = +2.63; $\overline{y}_{cm}$ = +0.10

ID# 9-1.3

I.O.# 028-04

Skill Rating 2

Diagram? yes

Answer: C

USNA Accepts ____

Ques. Proofed ____
Ques. Xeroxed ____

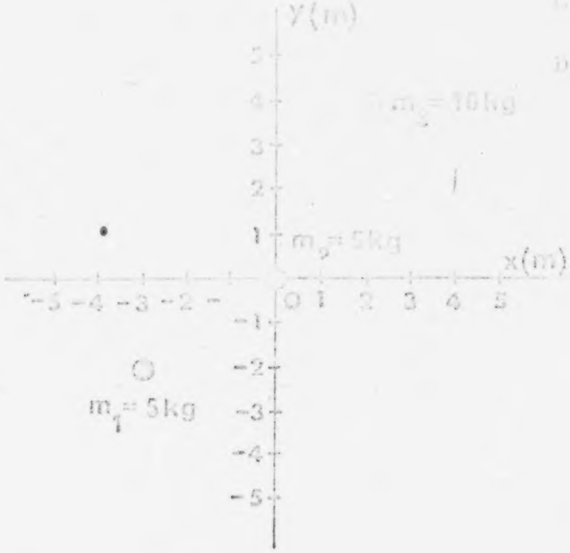
Diagram Made ____
Diagram OK ____
Diagram Xerox ____

To NYIT ____
To Computer ____
OK Computer ____

Answer Record ____

NYIT, Fall 1970

9-1.4



The coordinates of the center of mass of the system shown in the figure are, in meters

A. $\overline{x}_{cm}$ = +1.75; $\overline{y}_{cm}$ = +2.50

B. $\overline{x}_{cm}$ = +0.33; $\overline{y}_{cm}$ = +2.00

C. $\overline{x}_{cm}$ = [illegible]; $\overline{y}_{cm}$ = [illegible]

D. $\overline{x}_{cm}$ = +0.25; $\overline{y}_{cm}$ = +1.5.

ID# 9-1.4

T.O.# [illegible]

Skill Rating 2

Diagram? [illegible]

Answer: D

USNA Accepts

Ques. Proofed TJ

Ques. Xeroxed

Diagram Made

Diagram OK

Diagram Xerox

To NYIT

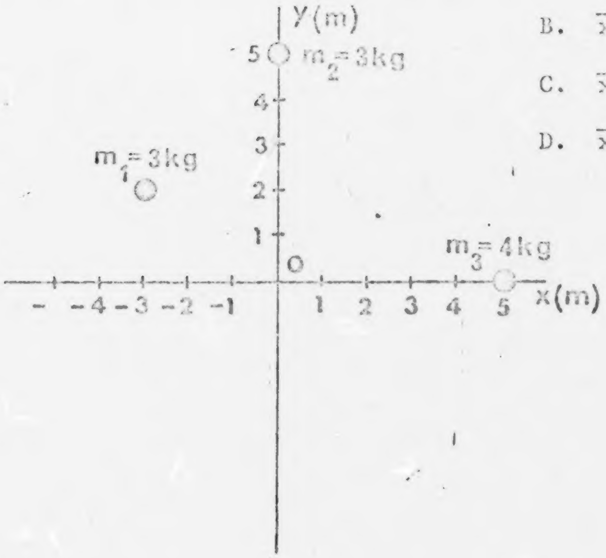
To Computer

OK Computer

Answer Record

NYIT, Fall 1970

9-1.5



The coordinates of the center of mass of the system shown in the figure are, in meters

A. $\overline{x}_{cm}$ = +1.1; $\overline{y}_{cm}$ = +2.1

B. $\overline{x}_{cm}$ = +2.9; $\overline{y}_{cm}$ = +2.1

C. $\overline{x}_{cm}$ = +1.57; $\overline{y}_{cm}$ = +3.5

D. $\overline{x}_{cm}$ = +1.1; $\overline{y}_{cm}$ = +3.5

ID# 9-1.5

T.O.# 028-04

Skill Rating 2

Diagram? yes

Answer: A

USNA Accepts

Ques. Proofed TJ

Ques. Xeroxed

Diagram Made

Diagram OK

Diagram Xerox

To NYIT

To Computer

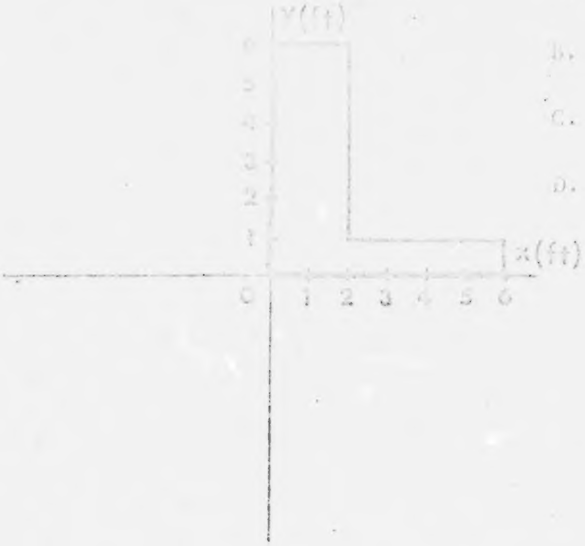
OK Computer

Answer Record

NYIT, Fall 1970

9-4.1

A piece of sheet metal has been cut into the shape shown. Assuming uniform thickness and mass density, the coordinates of the center of mass are, in ft



A. $\overline{x}_{cm} = +1.75$; $\overline{y}_{cm} = +2.37$

B. $\overline{x}_{cm} = +2.25$; $\overline{y}_{cm} = +2.37$

C. $\overline{x}_{cm} = +1.75$; $\overline{y}_{cm} = +1.83$

D. $\overline{x}_{cm} = +2.25$; $\overline{y}_{cm} = +1.83$

ID# 9-4.1

I.O.# [illegible]

Skill Rating [illegible]

Diagram? yes

Answer: [illegible]

USNA Accepts

Ques Proofed TA
Ques Xeroxed

Diagram Made
Diagram OK
Diagram Xerox

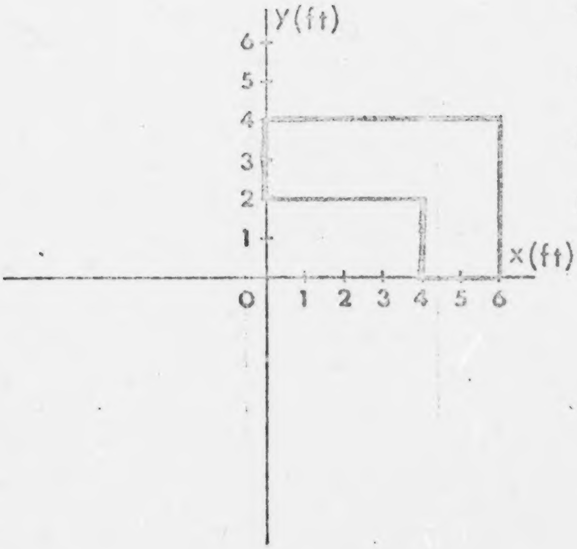
To NYIT
To Computer
OK Computer

Answer Record

NYIT, Fall 1970

9-4.2

A piece of sheet metal has been cut into the shape shown. Assuming uniform thickness and mass density, the coordinates of the center of mass are, in ft



A. $\overline{x}_{cm} = +1.5$; $\overline{y}_{cm} = +1.5$

B. $\overline{x}_{cm} = +3.5$; $\overline{y}_{cm} = +2.5$

C. $\overline{x}_{cm} = +3.5$; $\overline{y}_{cm} = +1.5$

D. $\overline{x}_{cm} = +1.5$; $\overline{y}_{cm} = +2.5$

ID# 9-4.2

I.O.# 028-00

Skill Rating 2

Diagram? yes

Answer: B

USNA Accepts

Ques Proofed TA
Ques Xeroxed

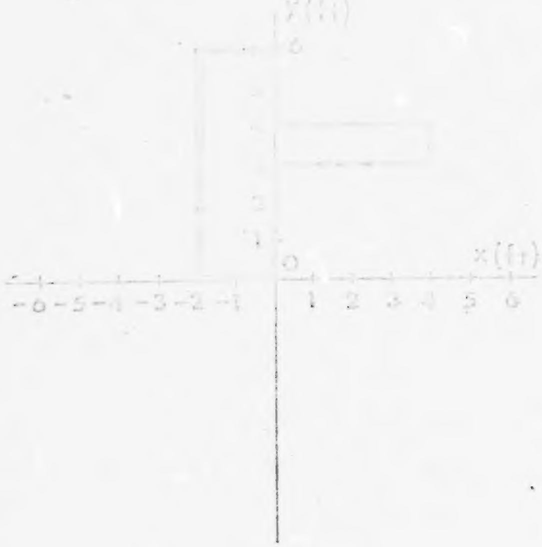
Diagram Made
Diagram OK
Diagram Xerox

To NYIT
To Computer
OK Computer

Answer Record

NYIT, Fall 1970

9-4.3



A piece of sheet metal has been cut into the shape shown. Assuming uniform thickness and mass density, the coordinates of the center of mass are, in ft

A. $\overline{x}_{cm} = +1.25$; $\overline{y}_{cm} = +2.5$

B. $\overline{x}_{cm} = +1.25$; $\overline{y}_{cm} = +3.13$

C. $\overline{x}_{cm} = -0.25$; $\overline{y}_{cm} = +3.13$

D. $\overline{x}_{cm} = -0.25$; $\overline{y}_{cm} = +2.5$

ID# 9-4.3

Skill Rating

Diag

Answer

================

USNA Accepts ____

Ques. Proofed TL

Ques. Xeroxed____

Diagram Made____

Diagram OK ____

Diagram Xerox____

To NYIT ____

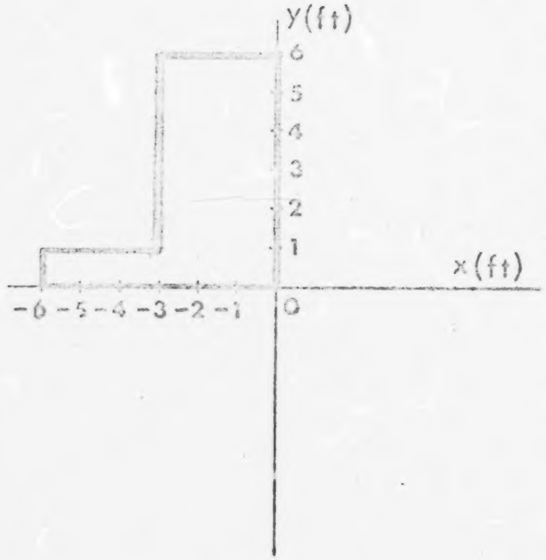
To Computer ____

OK Computer____

Answer Record____

NYIT, Fall 1970

9-4.4



A piece of sheet metal has been cut into the shape shown. Assuming uniform thickness and mass density, the coordinates of the center of mass are, in ft

A. $\overline{x}_{cm} = -1.5$; $\overline{y}_{cm} = +2.28$

B. $\overline{x}_{cm} = +1.93$; $\overline{y}_{cm} = +2.28$

C. $\overline{x}_{cm} = -1.5$; $\overline{y}_{cm} = +2.65$

D. $\overline{x}_{cm} = -1.93$; $\overline{y}_{cm} = +2.65$

ID# 9-4.4

I.O.# 028-00

Skill Rating 2

Diagram? yes

Answer: D

================

USNA Accepts ____

Ques. Proofed TL

Ques. Xeroxed____

Diagram Made____

Diagram OK ____

Diagram Xerox____

To NYIT ____

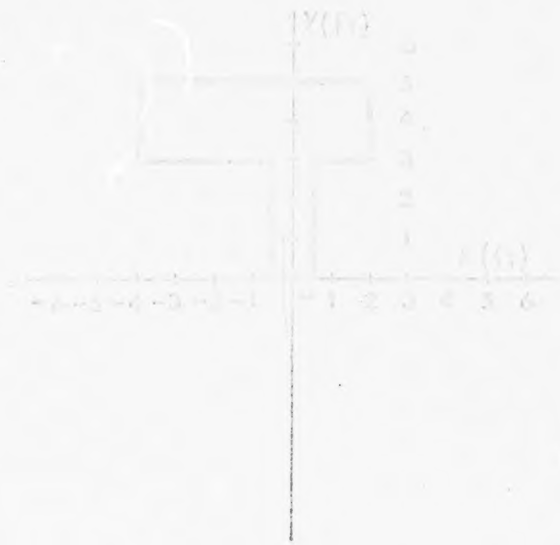
To Computer____

OK Computer____

Answer Record____

NYIT, Fall 1970

9-4.5



A piece of sheet metal has been cut into the shape shown. Assuming uniform thickness and mass density, the coordinates of the center of mass are, in ft

A. $x_{cm} = -0.8$; $y_{cm} = +3.5$

B. $x_{cm} = -1.01$; $y_{cm} = +4.5$

C. $x_{cm} = +1.[illegible]$; $y_{cm} = +4.0$

D. $x_{cm} = -0.30$; $y_{cm} = +4.0$

ID# 9-4.5

T.O.#

Skill Rating 2

Diagram?

Answer: D

USNA Accepts ___

Ques. Proofed TA

Ques. Xeroxed ___

Diagram Made ___

Diagram OK ___

Diagram Xerox ___

To NYIT ___

To Computer ___

OK Computer ___

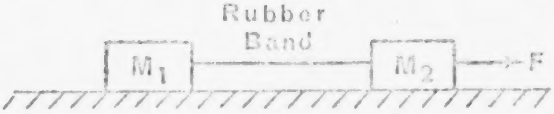
9-6.1 Masses $m_1$ and $m_2$ of 5kg and 10kg respectively are on a horizontal surface, and connected by a rubber band. A constant force (F) of 60nt is applied to $m_2$ as shown. The coefficient of kinetic friction between each mass and the horizontal surface is 0.2. When both masses are moving to the right, the acceleration of the center of mass is, in m/sec$^2$

A. 4.04

B. 2.40

C. 2.04

D. 1.95



ID# 9-6.1

T.O.# 029-00

Skill Rating 2

Diagram? yes

Answer: C

USNA Accepts ___

Ques. Proofed TA

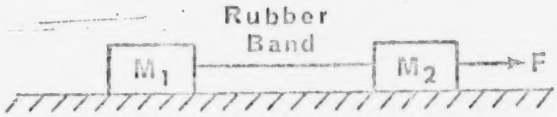
9-6.2 Masses $m_1$ and $m_2$ of 5kg and 10kg respectively are on a horizontal surface and connected by a rubber band. The coefficient of kinetic friction between each mass and the horizontal surface is 0.1. When both masses are moving to the right the acceleration of the center of mass is 3.68 m/sec$^2$. The magnitude of the constant force (F) applied to $m_2$ is, in nt

A. 70.0

B. 55.3

C. 51.5

D. 14.7



ID# 9-6.2

T.O.# 029-00

Skill Rating 2

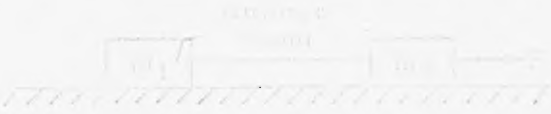
Diagram? yes

Answer: A

USNA Accepts ___

[illegible] Masses m1 and m2 of [illegible] slugs and [illegible] slugs respectively are on a horizontal surface and connected by a rubber band. The coefficient of kinetic friction between each mass and the horizontal surface is 0.1. When both masses are moving to the right the acceleration of the center of mass is [illegible] ft/sec². The magnitude of the constant force (F) applied to m2 is, in pounds

A. [illegible]
B. [illegible]
C. 32
D. 50

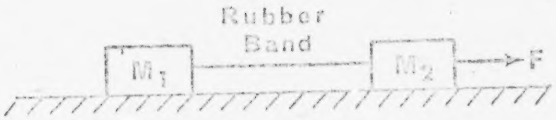


ID# [illegible]
I.O.# [illegible]
Skill Rating
Diagram?
Answer:

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox

9-6.4 Equal masses, $m_1$ and $m_2$, of mass 5 slugs each are on a horizontal surface and connected by a rubber band. A constant force (F) is applied to $m_2$ and when both masses are moving to the right the acceleration of the center of mass is 2.8 ft/sec$^2$. The coefficient of kinetic friction between each mass and the horizontal surface is the same and is of magnitude

A. 0.05
B. 0.10
C. 0.20
D. 0.38

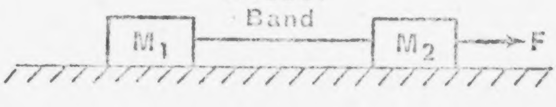


9-6.4
029-00
Skill Rating 2
Diagram? yes
Answer: B

USNA Accepts

9-6.5 Masses $m_1$ and $m_2$ of 10kg and 15kg respectively are on a horizontal surface, and connected by a rubber band. A constant force (F) of 100nt is applied to $m_2$ as shown. The coefficient of kinetic friction between each mass and the horizontal surface is 0.2. When both masses are moving to the right the acceleration of the cneter of mass is, in m/sec$^2$

A. 4.70
B. 4.00
C. 3.20
D. 2.04



ID# 9-6.5
I.O.# 029-00
Skill Rating 2
Diagram? yes
Answer: D

USNA Accepts
Ques. Proofed TA
Ques. Xeroxed
Diagram Made
Diagram OK

10-1.1 A 2-kg block slides along the frictionless track shown in the figure. If the blocks' speed at point B is 10 m/sec, the magnitude of the blocks' momentum at point A is, in kg-m/sec

A. 9.92

B. 20

C. 28

D. 50

10-1.1

030-00

Skill 2

yes

C

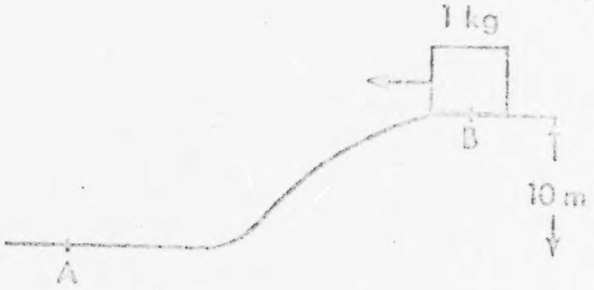
10-1.2 A 1-kg block slides along the frictionless track shown in the figure. If the blocks' momentum at point B is 6 kg-m/s, the speed of the block at point A is, in m/s

A. 6

B. 12.6

C. 15.2

D. 25.2



10-1.2

030-00

Skill 2

yes✓

C

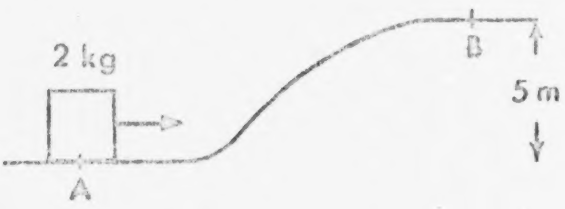
10-1.3 A 2-kg block slides along the frictionless track shown in the figure. If the blocks' momentum at point A is 40 kg-m/sec, the magnitude of the blocks' momentum at point B is, in kg-m/sec

A. 19.0

B. 34.6

C. 38.6

D. 40.0



10-1.3

030-00

Skill 2

yes✓

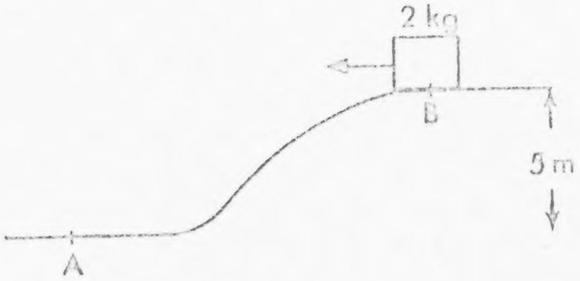
B

[illegible] A 2-kg block slides along the frictionless track shown in the [illegible] 10-1.[illegible]

[illegible]

10-1.5 A 2-kg block slides along the frictionless track shown in the figure. If the blocks' momentum at point B is 10 kg-m/sec, the speed of the block at point A is, in m/s

- A. 5
- B. 11.1
- C. 18.5
- D. 54



10-1.5

030-00

Skill 2

yes

B

10-5.1 Two particles of mass 2 kg and 3 kg respectively, are moving with a speed of 10 m/sec due east. A third particle of mass 2 kg is moving with a speed of 25 m/sec due south. The velocity of the center of mass, $V_{cm}$, of the system is

- A. 10.1 m/sec at 45° S of E
- B. 10.1 m/s at 45° N of E
- C. 66.5 m/s at 22° S of E
- D. 66.5 m/s at 22° N of E.

10-5.1

030-03

Skill 2

no

A

10-5.2 Three particles have masses and speeds as shown in the table.

| PARTICLE | MASS | SPEED AND DIRECTION |
|---|---|---|
| $m_1$ | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] |

The velocity of the center of mass, $V_{cm}$, of the system is

A. [illegible]

B. 1.25 m/sec at [illegible] N of E

C. 3.1 m/sec at [illegible] N of E

D. 4.25 m/s at 45° N of E.

10-5.3 Three particles have masses and speeds as shown in the table.

| PARTICLE | MASS | SPEED AND DIRECTION |
|---|---|---|
| $m_1$ | 3 kg | 5 m/sec due east |
| $m_2$ | 3 kg | 5 m/sec due east |
| $m_3$ | 4 kg | 10 m/sec due south |

The velocity of the center of mass, $V_{cm}$, of the system is

A. 11.4 m/sec at 63.5° S of E

B. 11.4 m/sec at 11.8° S of E

C. 5 m/sec at 53° S of E

D. 5 m/sec at 53° N of E

10-5.3
030-03
Skill 2
no
C

10-5.4 Three particles have masses and speeds as shown in the table. 10-5.4

| PARTICLE | MASS | SPEED AND DIRECTION | |
|---|---|---|---|
| [illegible] | [illegible] kg | [illegible] m/sec due east | [illegible] |
| $m_2$ | 4 kg | 5 m/sec due west | [illegible] |
| [illegible] | [illegible] kg | 25 m/sec due north | [illegible] |

The velocity of the center of mass, $\vec{V}_{cm}$, of the system is

A. 16.5 m/sec at [illegible]

B. 16.5 m/sec at 52° N of E

C. 8.7 m/sec at 53° N of E

D. 8.7 m/sec at 37° N of E

10-5.5 Three particles have masses and speeds as shown in the table. 10-5.5

| PARTICLE | MASS | SPEED AND DIRECTION | 030-03 |
|---|---|---|---|
| $m_1$ | 2 kg | 10 m/sec due east | Skill 2 |
| $m_2$ | 4 kg | 5 m/sec due west | no |
| $m_3$ | 5 kg | 6 m/sec due north | D |

The velocity of the center of mass, $\vec{V}_{cm}$, of the system is

A. 7.56 m/sec at 52.6° N of E

B. 7.56 m/sec at 37.4° N of E

C. 6 m/sec due north.

D. 2.72 m/sec due north

10-10.1 The total mass of a system is 5 kg, and the magnitude of the system's momentum is changing at the rate of [illegible]. The magnitude of the net external force exerted on the system is, in nt

A. 0.25

B. 4.0

C. [illegible]

D. 100

ID# 10-10.1

T.O.# [illegible]

Skill Rating [illegible]

Diagram? no

USNA Accepts ___

Ques. Proofed___

Ques. Xeroxed___

10-10.2 The total mass of a system is 2 kg, and the magnitude of the system's momentum is changing at the rate of 8 kg - m/sec$^2$. The magnitude of the net external force exerted on the system is, in nt

A. 8

B. 4

C. 2

D. 0.25

ID# 10-10.2

T.O.# 030-05

Skill Rating 0

Diagram? no

Answer: A

USNA Accepts ___

Ques. Proofed___

Ques Xeroxed___

10-10.3 The magnitude of the net external force on a system is 12 nt. If the total mass of the system is 3 kg, the magnitude of the system's rate of change of momentum is, in kg - m/sec$^2$

A. 36

B. 12

C. 4

D. 0.25

ID# 10-10.3

T.O.# 030-05

Skill Rating 0

Diagram? no

Answer: B

USNA Accepts ___

Ques. Proofed___

Ques Xeroxed___

Diagram Made___

Diagram OK ___

Diagram Xerox___

Ques Proofed___
Ques Xeroxed___

Diagram Made____
Diagram OK

10-10.5 The magnitude of the net external force exerted on a system is 20 nt. If the total mass of the system is 5 kg, the magnitude of the system's rate of change of momentum is, in kg - m/sec

A. 100

B. 20

C. 4

D. 0.25

ID# 10-10.5
L.O.# 030-05
Skill Rating 0
Diagram? no
Answer: B

USNA Accepts ____

10-13.1 A 6-ton, open-top freight car is coasting at a speed of [illegible] ft/sec along a frictionless horizontal track. It suddenly begains to rain hard, the raindrops falling vertically with respect to the ground. Assuming the car to be deep enough, so that the water does not spatter over the top of the car, the speed of the car after it has collected 4 tons of water is, in ft/sec

A. 4.8

B. 8.0

C. 12.0

D. 24.0

ID# 10-13.1
L.O.# 031-03
Skill Rating 1
Diagram? no
Answer: A

USNA Accepts ____

Ques Proofed___
Ques Xeroxed___

Diagram Made____
Diagram OK ____
Diagram Xerox___

10-13.2 An 8-ton, open-top freight car is coasting at a speed of 10 ft/sec along a frictionless horizontal track. It suddenly begins to rain hard, the rain drops falling vertically [illegible] over the top of the car, the speed of the car after it has collected 2 tons of water is, in ft/sec.

A. 40

B. 12.5

C. 10

D. 8

ID# 10-13.2

[illegible]

USNA Accepts ___

Ques. Proofed ___
Ques. Xeroxed ___

Diagram Made ___
Diagram OK ___
Diagram Xerox ___

To NY.T ___

10-13.3 A 9-ton, open-top freight car is coasting along a frictionless horizontal track. It suddenly begains to rain hard, the raindrops falling vertically with respect to the ground. Assuming the car to be deep enough, so that the water does not spatter over the top of the car, after the car has collected 3 tons of water it has a speed of 3 ft/sec. The speed of the car, before it begain to rain, must have been, in ft/sec

A. 1

B. 3

C. 4

D. 9

ID# 10-13.3

T.O # 031-03

Skill Rating 1

Diagram? no

Answer: C

10-13.4 An 8-ton, open-top freight car is coasting along a frictionles horizontal track. It suddenly begains to rain hard, the raindrops falling vertically with respect to the ground. Assuming the car to be deep enough, so that the water does not spatter over the top of the car, after the car has collected 4 tons of water it has a speed of 4 ft/sec. The speed of the car, before it begain to rain, must have been, in ft/sec

A. 2

B. 4

C. 6

D. 8

ID# 10-13.4

T.O # 031-03

Skill Rating 1

Diagram? no

Answer: C

USNA Accepts ___

Ques. Proofed ___
Ques. Xeroxed ___

Diagram Made ___
Diagram OK ___
Diagram Xerox ___

10-13.5 A 10-ton, open-top freight car is coasting along a frictionless horizontal track. [illegible] it begin to rain, must have been, in ft/sec

A. 2.5

B. 5

C. 7.5

D. 10

ID# 10-13.5
T.O.# [illegible]
Skill Rating 1
Diagram? no
Answer:

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____

10-16.1 Assume a rocket has an initial weight of 30,000 lb and a weight of 10,000 lb after the fuel is completely burned. Fuel is consumed at a rate of 320 lb/sec. The time interval after which the rocket attains its maximum velocity is, in seconds

A. 31.25

B. 62.50

C. 93.75

D. 125

ID# 10-16.1
T.O.# 032-22
Skill 1
Diagram? no
Answer: B

USNA Accepts ____
Ques. Proofed gil

10-16.2 Assume a rocket has an initial weight of 50,000 lb and a weight of 15,000 lb after the fuel is completely burned. Fuel is consumed at the rate of 400 lb/sec. The time interval after which the rocket attains its maximum velocity is, in seconds

A. 162.5

B. 125.0

C. 87.5

D. 37.5

ID# 10-16.2
T.O.# 032.22
Skill Rating 1
Diagram? no
Answer: C

USNA Accepts ____
Ques. Proofed gil
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT

10-16.3 Assume a rocket has an initial weight of 50,000 lb and a weight of 15,000 lb after the fuel is completely burned. The rocket attains its maximum velocity after 87.5 sec. The rate at which fuel is consumed is, in lb/sec.

A. 744

B. 520

C. 400

D. 172

ID# 10-16.3
T.O.# 032-22
Skill 1
Diagram? no
Answer: C

==============
USNA Accepts ____
Ques. Proofed SN
Ques. Xeroxed ____
Diagram Made ____
Diagram OK

10-16.4 Assume a rocket has an initial weight of 30,000 lb and a weight of 10,000 lb after the fuel is completely burned. The rocket attains its maximum velocity after 62.5 sec. The rate at which fuel is consumed is, in lb/sec

A. 640

B. 480

C. 320

D. 160

ID# 10-16.4
T.O.# 032-22
Skill 1
Diagram? no
Answer: C

==============
USNA Accepts ____
Ques. Proofed SN

10-16.5 Assume a rocket has an initial weight of 100,000 lb and a weight of 25,000 lb after the fuel is completely burned. Fuel is consumed at the rate of 550 lb/sec. The time interval after which the rocket attains its maximum velocity is, in seconds

A. 488.0

B. 154.0

C. 115.1

D. 38.5

ID# 10-16.5
T.O.# 032-22
Skill 1
Diagram? no
Answer: C

==============
USNA Accepts ____
Ques. Proofed SN
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT

10-19.[illegible] Masses $m_1$ and $m_2$ of 5 kg and 3 kg respectively are tied together with a compressed spring between them as shown. The spring is not attached to either mass. The system slides along a frictionless table with a velocity of +10 m/sec. At some point the string is cut and the masses fly apart along the original line of motion. The velocities of $m_1$ and $m_2$ after release are +7 m/sec and +15 m/sec respectively. The impulse imparted to mass [illegible] was, in kg-m/sec

A. [illegible]

B. [illegible]

C. [illegible]

D. +15

[illegible]
[illegible]
Skill Rating [illegible]
Diagram? [illegible]
Answer: [illegible]

[illegible] Accepts ___
Ques. Proofed___
Ques. Xeroxed___
Diagram Made___
Diagram OK ___
Diagram Xerox___
To NYIT ___
To Computer___
OK Computer___
Answer Record___
NYIT, Fall 1970

10-19.2 Masses $m_1$ and $m_2$ of 5 kg and 3 kg respectively are tied together with a compressed spring between them as shown. The spring is not attached to either mass. The system slides along a frictionless table with a velocity of +10 m/sec. At some point the string is cut and the masses fly apart along the original line of motion. The velocities of $m_1$ and $m_2$ after release are +7 m/sec and +15 m/sec respectively. The impulse imparted to mass $m_1$ was, in kg-m/sec

A. +15

B. -15

C. +35

D. -35

[illegible] 10-19.2
T.O # 033-04
Skill Rating 2
Diagram? yes
Answer: B

[illegible] Accepts ___
Ques. Proofed___
Ques. Xeroxed___
Diagram Made___
Diagram OK ___
Diagram Xerox___
To NYIT ___
To Computer___
OK Computer___
Answer Record___
NYIT, Fall 1970

[illegible]

A. [illegible]

B. [illegible]

C. [illegible]

D. [illegible]

Ques. Proofed___
Ques. Xeroxed___

Diagram Made___
Diagram OK___
Diagram Xerox___

To NYIT ___
To Computer___
OK Computer___

Answer Record___

NYIT, Fall 1970

10-19.4 Masses $m_1$ and $m_2$ of 5 kg and 3 kg respectively are tied together with a compressed spring between them as shown. The spring is not attached to either mass. The system slides along a frictionless table with a velocity of +10 m/sec. At some point the string is cut and the masses fly apart along the original line of motion. The magnitude of the impulse imparted to each mass is 15 kg-m/sec. After release the velocity of $m_1$ is, in m/sec

A. +15

B. -15

C. +7

D. -7

ID# 10-19.4

T.O.# 033-04

Skill Rating 2

Diagram? yes

Answer: C

USNA Accepts ___

Ques. Proofed___
Ques. Xeroxed___

Diagram Made___
Diagram OK___
Diagram Xerox___

To NYIT ___
To Computer___
OK Computer___

Answer Record___

NYIT, Fall 1970

11-1.1 An impulsive force which varies according to the relation $F = 4 + t$ is applied to a block. If the force is applied for a total time of T seconds, the magnitude of the total impulse is

A. $4T + T^2$

B. $4T + (T^2/2)$

C. $T^2/2$

D. $4T^2$

ID# 11-1.1

T.O.# 0 34-01

Skill 2

Diagram? No

Answer: B

==============

USNA Accepts ____

Ques. Proofed ____
Ques. Xeroxed ____

Diagram Made ____
Diagram OK ____
Diagram Xerox ____

To NYIT ____
To Computer ____
OK Computer ____

Answer Record ____

NYIT, Fall 1970

11-1.2 An impulsive force which varies according to the relation

$$F = kt^2$$

is applied to a block. If the force is applied for a total time of T seconds, the magnitude of the total impulse is

A. FT

B. $kT^3/3$

C. $kT^2$

D. $kT^3$

ID# 11-1.2
T.O.#OBJ 0 34-01
Skill 2
Diagram? No
Answer: B

= = = = = = = = = = = = = =
USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT

11-1.3 An impulsive force which varies according to the relation $F = 3 + 2t$ is applied to a block. If the force is applied for a total time of T seconds, the magnitude of the total impulse is

A. $3 + 2T$

B. $3T + 2T^2$

C. $3T + T^2$

D. $3T + (T^2/2)$

ID# 11-1.3
T.O. # 0 34-01
Skill 2
Diagram? No
Answer: C

11-1.4 An impulsive force which varies according to the relation $F = 2t + 3t^2$ is applied to a block. If the force is applied for a total time of T seconds, the magnitude of the total impulse is

A. $2T + 3T^2$

B. $2T^2 + 3T^3$

C. $2/3\ (T^2 + T^3)$

D. $T^2 + T^3$

ID# 11-1.4
T.O. # 0 34-01
Skill 2
Diagram? No
Answer: D

= = = = = = = = = = = = = =
USNA Accepts ____
Ques. Proofed ✓
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT

11-1.5 An impulsive force which varies according to the relation $F = 2t + 4t^3$ is applied to a block. If the force is applied for a total time of T seconds, the magnitude of the total impulse is

A. $2T + 4T^3$

B. $T^2 + T^4$

C. $2T^2 + 4T^4$

D. $2 + 12T^2$

ID# 11-1.5
T.O.# 034-01
Skill 2
Diagram? No
Answer: _____

==============
USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox

11-5.1 The average force necessary to stop 3200 lb car moving at a speed of 60 ft/sec in 6.0 seconds is, in pounds

A. 36,000
B. 32,000
C. 3170
D. 1000

ID# 11-5.1
T.O.# 034-00
Skill 2
Diagram? No
Answer: D

==============
USNA Accepts ____

11-5.2 A batter hits a line drive reversing the original direction of the ball's motion. The initial and final speeds of the ball are 100 ft/sec respectively. If the ball weighs 4 oz and is in contact with the bat for 0.01 seconds, the average force exerted on the ball is, in pounds

A. 7000
B. 715
C. 156
D. 62.8

ID# 11-5.2
T.O.# 034-00
Skill 2
Diagram? No
Answer: C

==============
USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____

11-5.3 A 3200 lb car traveling at a speed of 60 miles/hr is brought to a stop by an average force of 880 lb. The time required to stop the car is, in seconds

A. 31.7
B. 20.2
C. 10
D. 6.18

ID# 11-5.3
T.O.# 034-00
Skill 2
Diagram? No
Answer: C

USNA Accepts ____
Ques. Proofed

11-5.4 A batter hits a line drive reversing the original direction of the ball's motion. An average force of 780 pounds acts for 0.002 seconds. The ball weighs 4 oz. If the initial speed of the ball is 90 ft/sec the final speed is, in ft/sec.

A. 62.5

B. 110

C. 200

D. 290

ID# 11-5.4
TO# 034-00
Skill 2
Diagram? no
Ans: B

USNA Accepts ____
Ques. Proofed SN
Ques. Xeroxed ____
Diagram Made

11-5.5 A batter hits a line drive reversing the original direction of the ball's motion. An average force of 800 pounds is exerted on the ball, and the ball weighs 4 oz. If the initial and final speeds of the ball are 80 ft/sec and 120 ft/sec respectively the time during which the force was exerted was, in seconds.

A. $6.40 \times 10^{-3}$

B. $1.95 \times 10^{-3}$

C. $1.08 \times 10^{-3}$

D. $0.39 \times 10^{-3}$

ID# 11-5.5
TO# 034-00
Skill 2 Type ____
Diagram? no
Ans: B

USNA Accepts ____
Ques. Proofed SN
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____

11-11.1 A machine gunner on the bow of a boat fires his gun horizontally. The gun is firing 500 rounds per minute. Each shell weighs 2 ounces and has a muzzle speed of 3200 ft/sec. The combined weight of the boat, gunner, machine gun, etc., is 2400 pounds. Neglecting friction and assuming the boat to be initially at rest, what is its speed after 12 seconds of continuous firing?

A. 83.5 ft/sec
B. 16.7 ft/sec
C. 13.0 ft/sec
D. 2.60 ft/sec

ID# 11-11.1
T.O.# 031-00
Skill 2
Diagram? No
Answer: B

==============
USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____

11-11.2 A machine gunner on the bow of a boat fires his gun horizontally. The gun is firing 500 rounds per minute. The combined weight of the boat, gunner, machine gun, etc., is 2000 pounds and after 12 seconds of continuous firing the boat which was initially at rest has a speed of 20 ft/sec. If each shell weighs 2 ounces and friction can be neglected the muzzle speed of the shell is, in ft/sec

A. 200
B. 320
C. 2000
D. 3200

ID# 11-11.2
T.O.# 031-00
Skill 2
Diagram? No
Answer: D

==============
USNA Accepts ____
Ques. Proofed ____

11-11.3 A machine gunner on the bow of a boat initially at rest fires his gun horizontally. Each shell weighs 2 ounces and has a muzzle speed of 3200 ft/sec. The combined weight of the boat, gunner, machine gun, etc., is 2400 pounds. After 12 seconds of continuous firing the speed of the boat is 16.7 ft/sec. Neglecting friction the firing rate of the gun is, in rounds per minute

A. 8000
B. 2500
C. 800
D. 500

ID# 11-11.3
T.O.# 031-00
Skill 2
Diagram? No
Answer: D

==============
USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____

11-11.4 A machine gunner on the bow of a boat fires his gun horizontally. The gun is firing 500 rounds per minute. Each shell weighs 2 ounces and has a muzzle speed of 3200 ft/sec. The combined weight of the boat, gunner, machine gun, etc., is 2400 pounds. Neglecting friction and assuming the boat to be initially at rest the final speed of the boat is 16.7 ft/sec. The length of time that the gun was continuously fired is, in seconds

A. 72
B. 12
C. 2
D. 0.75

ID# 11-11.4
T.O.# 031-00
Skill 2
Diagram? No
Answer: B

USNA Accepts ____
Ques. Proofed SH
Ques. Xeroxed ____
Diagram Made ____

11-11.5 A machine gunner on the bow of a boat fires his gun horizontally. The gun is firing 500 rounds per minute. Each shell weighs 2 ounces and has a muzzle speed of 3200 ft/sec. The combined weight of the boat, gunner, machine gun, etc., is 2000 pounds. Neglecting friction and assuming the boat to be initially at rest, its speed after 12 seconds of continuous firing is, in ft/sec

A. 320
B. 100
C. 32
D. 20

ID# 031-00
T.O.# 031-00
Skill 2
Diagram? No
Answer: D

USNA Accepts ____
Ques. Proofed

11-15.1 A freight car weighing 12 tons rolls at 3 ft/sec along a level track and collides with a car weighing 20 tons, standing at rest with its brakes released. If the cars couple together their speed after the collision is, in ft/sec

A. 1.97
B. 1.80
C. 1.13
D. 0

ID# 11-15.1
T.O.# 037-07
Skill 2
Diagram? No
Answer: C

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____

11-15.2 On a frictionless horizontal table, a 3-kg mass moving at 4 m/sec to the right collides with an 8-kg mass moving at 1.5 m/sec to the left. If the blocks stick together after the collision their speed is, in m/sec

A. 8.00
B. 3.00
C. 2.18
D. 0

ID# 11-15.2
T.O.# 037-07
Skill 2
Diagram? No
Answer: D

11-15.3 On a frictionless horizontal table, a 2-kg mass moving at 5 m/sec to the right collides with a 3-kg mass moving at 2 m/sec to the left. If the blocks stick together after the collision their speed is, in m/sec.

A. 3.33
B. 2.00
C. 0.80
D. 0

ID# 11-15.3
T.O.# 037-07
Skill 2
Diagram? No
Answer: C

11-15.4 On a frictionless horizontal table, a 4-kg mass moving at 5 m/sec to the right collides with a 4-kg mass moving at 3 m/sec to the left. If the blocks stick together after the collision their speed is, in m/sec

A. 0
B. 1
C. 4
D. 5

ID# 11-15.4
T.O.# 037-07
Skill 2
Diagram? No
Answer: B

11-15.5 On a horizontal frictionless table, a 4-kg mass moving to at 4 m/sec to the right collides with a 1-kg mass moving at 6 m/sec to the left. If the blocks stick together after the collision their speed is, in m/sec

A. 2.0
B. 2.5
C. 4.0
D. 4.4

ID# 11-15.5
T.O.# 037-07
Skill 2
Diagram? No
Answer: A

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____

11-18.1 A steel ball of 2-kg mass ($m_1$), moving to the right along a horizontal frictionless surface at a speed of 8 m/sec, collides head-on with a steel ball of 3-kg mass ($m_2$) moving to the left at 4 m/sec. After the collision, $m_2$ is moving to the right at 5.6 m/sec. Assuming the collision to be perfectly elastic, the velocity of $m_1$ after the collision is, in m/sec

A. +5.60

B. +3.73

C. -4.27

D. -6.40

ID# 11-18.1

T.O.# 037-06

Skill 2

Diagram? No

Answer: D

==============

USNA Accepts ____

Ques. Proofed SN

Ques. Xeroxed ____

Diagram Made ____

Diagram OK ____

11-18.2 A steel ball of 2-kg mass ($m_1$), moving to the right along a horizontal frictionless surface at a speed of 8 m/sec, collides head-on with a steel ball of 3-kg mass ($m_2$) moving to the left at 4 m/sec. After the collision $m_1$ is moving to the left at 6.4 m/sec. Assuming the collision to be perfectly elastic, the velocity of $m_2$ after the collision is, in m/sec

A. +13.6

B. +5.60

C. +5.07

D. -2.93

ID# 11-18.2

T.O.# 037-06

Skill 2

Diagram? No

Answer: B

==============

USNA Accepts ____

Ques. Proofed SN

Ques. Xeroxed

11-18.3 A steel ball of mass 4-kg ($m_1$), moving to the right along a horizontal frictionless surface at a speed of 8m/sec, collides head-on with a steel ball of 1-kg mass ($m_2$) moving to the left at 3 m/sec. After the collision $m_1$ is moving to the right at 3.6 m/sec. Assuming the collision to be perfectly elastic, the velocity of $m_2$ after the collision is, in m/sec

A. +20.6

B. +14.6

C. +7.85

D. +4.23

ID# 11-18.3

T.O.# 037-06

Skill 2

Diagram? No

Answer: B

==============

USNA Accepts ____

Ques. Proofed SN

Ques. Xeroxed ____

Diagram Made ____

Diagram OK ____

11-18.4 A steel ball of mass 4-kg ($m_1$), moving to the right along a horizontal frictionless surface at a speed of 8 m/sec collides head-on with a steel ball of 1-kg mass ($m_2$) moving to the left at 3 m/sec. After the collision $m_2$ is moving to the right at 14.6 m/sec. Assuming the collision to be perfectly elastic, the velocity of $m_1$ after the collision is, in m/sec

A. +7.85

B. +6.35

C. +5.10

D. +3.60

ID# 11-18.4
T.O.# 037-06
Skill 2
Diagram? No
Answer: D

==============
USNA Accepts ____
Ques. Proofed SA
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To N/TT ____
To Computer ____
OK Computer

11-18.5 A steel ball of mass 3-kg ($m_1$), moving to the right along a horizontal frictionless surface at a speed of 6 m/sec collides head-on with a steel ball of 2-kg mass ($m_2$) moving to the left at 4 m/sec. After the collision, $m_1$ is moving to the left at 2 m/sec. Assuming the collision to be perfectly elastic, the velocity of $m_2$ after the collision is, in m/sec

A. +16

B. +10

C. +8

ID# 11-18.5
T.O.# 037-06
Skill 2
Diagram? No
Answer: C

==============
USNA Accepts ____

12-1.1 In a one-dimensional elastic collision between two objects, mass $m_2$ is initially at rest and mass $m_1$ has a velocity of 5.0 m/sec. If $m_1 = m_2$ what is the velocity of $m_2$ after the collision?

$v_2$ = ____________

ID# 12-1.1
T.O.# 037-00
Skill 2
Diagram? no
Answer: 5.0 m/sec

==============
USNA Accepts ____
Ques. Proofed SA
Ques. Xeroxed ____

12-1.2 In a one-dimensional elastic collision between two objects, mass $m_2$ is initially at rest. If $m_1 = 3\ m_2$ and the velocity of $m_1$ after the collision is 5.0 m/sec, what was the velocity of $m_1$ before the collision?

$v_1$ = ____________

ID# 12-1.2
T.O.# 037-00
Skill 2
Diagram? no
Answer: 10 m/sec
==============
USNA Accepts ____

12-1.3 In a one-dimensional elastic collision between two objects, mass $m_1 = 6$ kg has an initial velocity of 8.0 m/sec while mass $m_2$ is initially at rest. The final velocity of $m_1$ is 4.0 m/sec. -What is the mass of $m_2$?

$m_2$ = ____________

ID# 12-1.3
T.O.# 037-00
Skill 2
Diagram? no
Answer: 2.0 kg

12-1.4 In a one-dimensional elastic collision between two objects, mass $m_2$ is initially at rest. If $u_1 = 24$ m/sec and $m_2 = 2\ m_1$, what is the final velocity of $m_1$?

$v_1$ = ____________

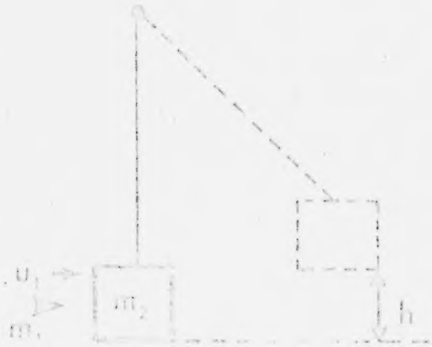
ID# 12-1.4
T.O.# 037-00
Skill 2
Diagram? no
Answer: -8 m/sec

12-1.5 In a one-dimensional elastic collision between two objects, mass $m_1 = 2$ kg has an initial velocity of 12 m/sec and mass $m_2 = 4$ kg has an initial velocity of 6 m/sec in the same direction. What is the velocity of $m_2$ after the collision?

$v_2$ = ____________

ID# 12-1.5
T.O.# 037-00
Skill Rating 2
Diagram? no
Answer: 10 m/sec
================
USNA Accepts ____
Ques. Proofed
Ques. Xeroxed ____

12-6.1



A 12-gram bullet traveling horizontally with a muzzel speed of 500 m/sec strikes a block suspended from a fixed point with a 3.0 meter massless, inextensible cord. If the bullet remains imbedded in the block and the block rises a height h = .744 meters, what is the mass of the block? (Neglect air resistance.)

A. 0.66 kg

B. 1.56 kg

C. 1.70 kg

D. 37.5 kg

E. 123 kg

ID# 12-6.1

T.O.# 037-00

Skill 2

Diagram? yes

Answer: B

==============

USNA Accepts ____

Ques. Proofed SJ

Ques. Xeroxed ____

Diagram Made ____

Diagram OK ____

Diagram Xerox ____

To NYIT ____

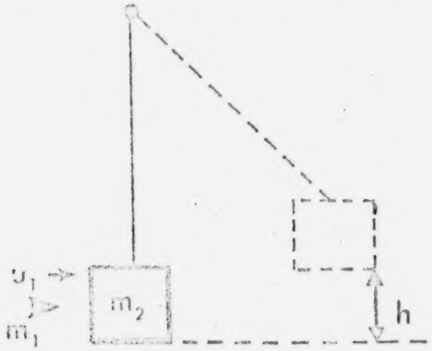
To Computer ____

OK Computer ____

Answer Record ____

NYIT, Fall 1970

12-6.2



A 30-gram bullet traveling horizontally strikes a 1.5 kg block suspended from a fixed point with a 3.0 meter massless inextensible cord. The bullet remains imbedded in the block and the block rises a height h = 2.0 meters. Find the speed of the bullet, $u_1$, just prior to striking the block. (Neglect air resistance)

A. 955 m/sec

B. 577 m/sec

C. 318 m/sec

D. 36.5 m/sec

ID# 12-6.2

T.O.# 037-00

Skill 2

Diagram? yes

Answer: C

==============

USNA Accepts ____

Ques. Proofed SJ

Ques. Xeroxed ____

Diagram Made ____

Diagram OK ____

Diagram Xerox ____

To NYIT ____

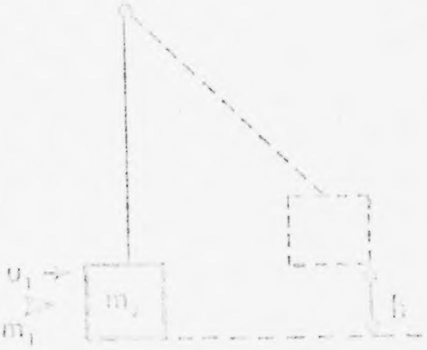
To Computer ____

OK Computer ____

Answer Record ____

NYIT, Fall 1970

12-6.3



A bullet traveling horizontally with a muzzel speed of 900 ft/sec strikes a 10-lb block suspended from a fixed point with a 4.0 ft massless inextensible cord. The bullet remains imbedded in the block and the block rises a height h = 2 ft. What is the weight of the bullet in ounces? (Neglect air resistance.)

A. 1.12 ounces

B. 2.03 ounces

C. 2.28 ounces

D. 2.53 ounces

ID# 12-6.3

T.O.# 037-00

Skill 2

Diagram? yes

Answer: B

==============

USNA Accepts ___

Ques. Proofed SN

Ques. Xeroxed___

Diagram Made ___

Diagram OK ___

Diagram Xerox___

To NYIT ___

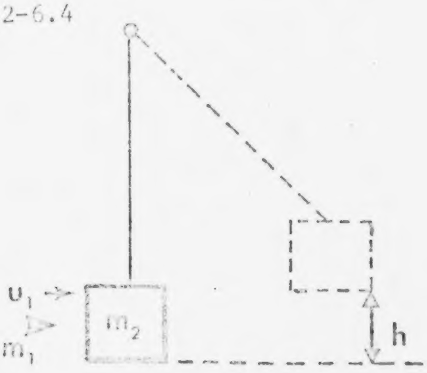
To Computer ___

OK Computer ___

Answer Record___

NYIT, Fall 1970

12-6.4



A 2-lb ball of putty traveling horizontally with a speed of 10 ft/sec strikes a 5 lb block suspended from a fixed point with a 10 ft massless, inextensible cord. If the putty sticks and remains stuck to the block, how high does the block rise? (Neglect air resistance.)

A. 1.64 ft

B. .625 ft

C. .447 ft

D. .128 ft

ID# 12-6.4

T.O.# 037-00

Skill 2

Diagram? yes

Answer: D

==============

USNA Accepts ___

Ques. Proofed SN

Ques. Xeroxed___

Diagram Made ___

Diagram OK ___

Diagram Xerox___

To NYIT ___

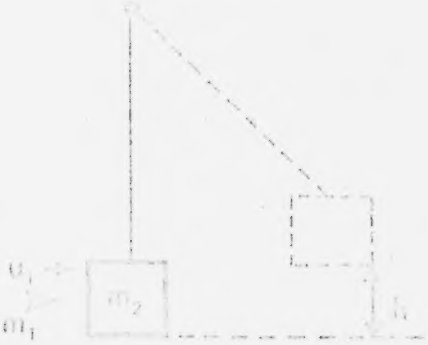
To Computer ___

OK Computer ___

Answer Record___

NYIT, Fall 1970

12-6.5



A 3-lb ball of putty traveling horizontally strikes a 6-lb block suspended from a fixed point with a 10 ft massless inextensible cord. The putty sticks and remains stuck to the block and the block rises to a height h = 1.5 ft. Find the speed of the putty, $u_1$, just prior to striking the block. (Neglect air resistance)

A. 58.8 ft/sec

B. 29.4 ft/sec

C. 16.9 ft/sec

D. 13.8 ft/sec

ID# 12-6.5
T.O.# 037-00
Skill 2
Diagram? Yes
Answer: B

USNA Accepts ___
Ques. Proofed ___
Ques. Xeroxed ___
Diagram Made ___
Diagram OK ___
Diagram Xerox ___
To NYIT ___

13-1.1 An electron of mass $m_e = 9.1 \times 10^{-32}$ kg revolves about a proton of mass $m_p = 1.7 \times 10^{-27}$ kg in circular orbit with a radius of $1.55 \times 10^{-10}$ m. What is the gravitational force of the proton on the electron? The universal gravitational constant is $6.67 \times 10^{-11}$ nt m$^2$/kg$^2$.

F = ___

ID# 13-1.1
TO# 041-00
Skill 1 Type ___
Diagram? no
Ans:
$4.3 \times 10^{-49}$ nt

USNA Accepts ___

13-1.2 An electron of mass $m_e = 9.1 \times 10^{-32}$ kg revolves about a proton of mass $m_p = 1.7 \times 10^{-27}$ kg in circular orbit. The gravitational force of the proton on the electron is $2.1 \times 10^{-49}$ nt. What is the radius of orbit of the electron? The universal gravitational constant is $6.67 \times 10^{-11}$ nt m$^2$/kg$^2$.

r = ___

ID# 13-1.2
TO# 041-00
Skill 1 Type ___
Diagram? no
Ans:
$2.22 \times 10^{-10}$ m

USNA Accepts ___
Ques. Proofed ___
Ques. Xeroxed ___

13-1.3 A mass of 10 kg revolves about a mass of $10^6$ kg in circular orbit with a radius of 10 m. The two masses are isolated from all other masses in the universe. What is the gravitational force exerted on the 10 kg mass by the $10^6$ kg mass? The universal gravitational constant is $6.67 \times 10^{-11}$ nt $m^2/kg^2$.

F = ____________

ID# 13-1.3
TO# 041-00
Skill 1 Typ: ___
Diagram? no
Ans: ____________
$6.67 \times 10^{-6}$ nt

13-1.4 A mass of 10 kg revolves about a mass of $10^6$ kg in circular orbit. The two masses are isolated from all other masses in the universe. The $10^6$ kg mass exerts a gravitational force of $6.67 \times 10^{-7}$ nt on the 10 kg mass. What is the radius of orbit of the 10 kg mass? The universal gravitational constant is $6.67 \times 10^{-11}$ nt $m^2/kg^2$.

r = ____________

ID# 13-1.4
TO# 041-00
Skill 1 Typ: ___
Diagram? no
Ans: 31.7 m

13-1.5 Mass A is in orbit about mass B and mass A exerts a gravitational force of 20 nt on mass B. Masses A and B are isolated from all other masses in the universe. If the radius of orbit is doubled, what will be the gravitational force of mass A on mass B?

F = ____________

ID# 13-1.5
TO# 041-00
Skill 1 Typ: ___
Diagram? no
Ans: 5 nt

13-4.1 A certain planet has a mass of $3.6 \times 10^{22}$ kg and a radius of $9.0 \times 10^5$ meters. A satellite in circular orbit about the planet has a period of $3.63 \times 10^3$ seconds. What is the radius of the satellite's orbit? The universal gravitational constant is $6.67 \times 10^{-11}$ nt $m^2/kg^2$.

r = ____________

ID# 13-4.1
TO# 041-00
Skill 2 Typ: ___
Diagram? no
Ans: $9.3 \times 10^5$ m

USNA Accepts ___
Ques. Proofed ___

13-4.2 A planet with a mass of $3.6 \times 10^{22}$ kg has a radius of $9.0 \times 10^{5}$ meters. A satellite is in circular orbit about the planet at a height of $3.0 \times 10^{4}$ meters above the surface of the planet. What is the period (time to complete one orbit) of the satellite? The universal gravitational constant is $6.67 \times 10^{-11}$ nt m$^2$/kg$^2$.

T = ________ sec

ID# 13-4.2
TO# 041-00
Skill 2 Type ____
Diagram? no
Ans: 3640 sec

13-4.3 A satellite is in circular orbit about a planet. The radius of orbit is $9.3 \times 10^{5}$ m and the period (time for one complete orbit) is $7.26 \times 10^{3}$ sec. What is the mass of the planet? The universal gravitational constant is $6.67 \times 10^{-11}$ nt m$^2$/kg$^2$.

M = ______ kg

ID# 13-4.3
TO# 041-00
Skill 2 Type ____
Diagram? no
Ans: $9.0 \times 10^{21}$ kg

USNA Accepts ____
Ques. Proofed ____

13-4.4 A satellite is in circular orbit about a planet at a height of $3 \times 10^{4}$ m above the surface of the planet. The period (time for one complete orbit) is $3.63 \times 10^{3}$ seconds and the radius of the planet is $9.0 \times 10^{5}$ m. What is the gravitational acceleration, g, at the surface of the planet? The universal gravitational constant is $6.67 \times 10^{-11}$ nt m$^2$/kg$^2$.

g = ____________

ID# 13-4.4
TO# 041-00
Skill 2 Type ____
Diagram? no
Ans: 2.96 m/sec$^2$

13-4.5 A satellite is in circular orbit about a planet which has a mass of $3.6 \times 10^{22}$ kg. The time required to make one complete orbit is $3.63 \times 10^{3}$ sec. What is the speed of the satellite? The universal gravitational constant is $6.67 \times 10^{-11}$ nt m$^2$/kg$^2$.

v = ____________

ID# 13-4.5
TO# 041-00
Skill 2 Type ____
Diagram? no
Ans: ____________
$1.61 \times 10^{3}$ m/sec

USNA Accepts

13-10.1 In the following equation the symbol, m, stands for gravitational mass.

$$\vec{F} = m\vec{a}$$

☐ True ☐ False

ID# 13-10.1
IO# 043-00
Skill 0 Type
Diagram? no
Ans: False

13-10.2 In the following equation the symbol, m, stands for gravitational mass.

$$T = 2\pi\sqrt{m/k}$$

☐ True ☐ False

ID# 13-10.2
IO# 043-00
Skill 0 Type
Diagram? no
Ans: False

13-10.3 In the following equation the symbol, m, stands for inertial mass.

$$F = \frac{GMm}{r^2}$$

☐ True ☐ False

ID# 13-10.3
IO# 043-00
Skill 0 Type
Diagram? no
Ans: False

13-10.4 In the following equation the symbol, m, stands for inertial mass.

$$\vec{p} = m\vec{v}$$

☐ True ☐ False

ID# 13-10.4
IO# 043-00
Skill 0 Type
Diagram? no
Ans: True

13-10.5 In the following equation the symbol, m, stands for gravitational mass.

$$U = mgh$$

☐ True ☐ False

ID# 13-10.5
TO# 043-00
Skill 0 Type
Diagram? no
Ans: True

USNA Accepts
Ques. Proofed
Ques. Xeroxed

13-11.1 Assume a perfectly spherical Earth of radius $6.37 \times 10^6$ with its axis through both poles and with a period of revolution about this axis of 86,400 seconds. If a 50-kg man weighs 490 nt at either pole his weight on the equator would be, in nt

(Assume the weighing to be done with a "massless" spring balance.)

A. 491.69

B. 490.00

C. 488.31

D. 473.10

ID# 13-11.1
TO# 042-00
Skill 2 Type
Diagram? No
Ans: C

USNA Accepts
Ques. Proofed
Ques. Xeroxed

13-11.2 Assume a perfectly spherical Earth of radius $6.37 \times 10^6$ m with its axis through both poles, and with a period of revolution about this axis of 86,400 seconds. If a 50-kg man weighs 488.31 nt on the equator, his weight on either pole would be, in nt

(Assume g to be 9.8 $m/sec^2$ and the weighing to be done with a "massless" spring balance.)

A. 486.62

B. 488.31

C. 490.00

D. 491.69

ID# 13-11.2
TO# 042-00
Skill 2 Type
Diagram? No
Ans: C

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK

13-11.3 Assume a perfectly spherical Earth of radius $6.37 \times 10^6$ m with its axis through both poles and with a period of revolution about this axis of 86,400 seconds. If an 80-kg man weighs 784 nt at either pole his weight on the equator would be, in nt

(Assume the weighing to be done with a "massless" spring balance.)

A. 779.85

B. 781.30

C. 784.00

D. 786.7

ID# 13-11.3
TO# 042-00
Skill 2 Type ____
Diagram? No
Ans: B

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

13-11.4 Assume a perfectly spherical Earth of radius $6.37 \times 10^6$ m with its axis through both poles and with a period of revolution about this axis of 86,400 seconds. If an 80-kg man weighs 781.30 nt on the equator, his weight on either pole would be, in nt

(Assume g to be 9.8 m/sec$^2$ and the weighing to be done with a "massless" spring balance.)

A. 786.70

B. 784.00

C. 781.30

D. 778.60

ID# 13-11.4
TO# 042-00
Skill 2 Type ____
Diagram? No
Ans: B

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

13-11.5 Assume a perfectly spherical Earth of radius $6.37 \times 10^6$ m with its axis through both poles and with a period of revolution about this axis of 86,400 seconds. If a 70-kg man weighs 686 nt at either pole his weight on the equator would be, in nt

(Assume the weighing to be done on a "massless" spring balance.)

A. 682.38

B. 683.64

C. 686.00

D. 688.36

ID# 13-11.5
TO# 042-00
Skill 2 Type
Diagram? No
Ans: B

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

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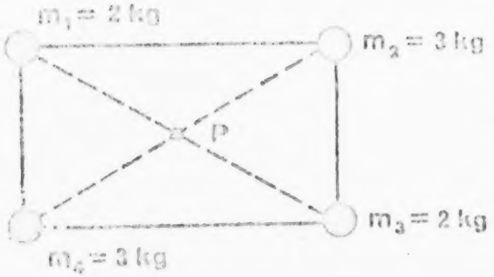
13-15.1



Masses $m_1$, $m_2$, $m_3$ and $m_4$ are located at the corners of a rectangle as shown. The gravitational fields strength ($\gamma$) at point P is

A. A vector directed toward $m_2$

B. A vector directed toward $m_3$

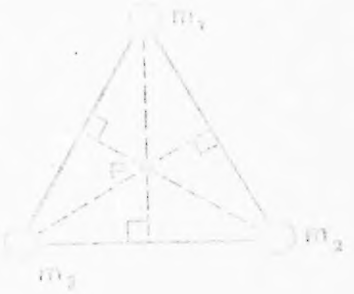
C. A vector directed toward $m_4$

D. Zero

ID# 13-15.1
T.O.# 041-00
Skill 1
Diagram? Yes
Answer: D

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

13-15.2



Three equal masses are located at the vertices of an equilateral triangle as shown in the figure. The gravitational field strength (γ) at point P is .

A. A vector directed toward $m_1$

B. A vector directed tow.d $m_2$

C. A vector directed toward $m_3$

D. Zero

ID# 13-15.2

TO# 041-00

Skill 1 Type

Diagram? yes

Ans: D

================

USNA Accepts

Ques. Proofed

Ques. Xeroxed

Diagram Made

Diagram OK

Diagram Xerox

To NYIT

To Computer

OK Computer

Answer Record

NYIT, Fall 1970

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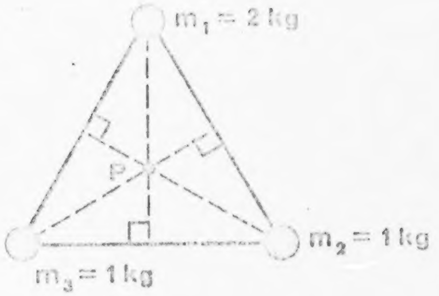
13-15.3



Three masses $m_1$, $m_2$ and $m_3$ are located at the vertices of an equilateral triangle as shown in the figure. The gravitational field strength (γ) at Point P is

A. A vector directed toward $m_1$

B. A vector directed toward $m_2$

C. A vector directed toward $m_3$

D. Zero

ID# 13-15.3

TO# 041-00

Skill 1 Type

Diagram? Yes

Ans: A

================

USNA Accepts

Ques. Proofed

Ques. Xeroxed

Diagram Made

Diagram OK

Diagram Xerox

To NYIT

To Computer

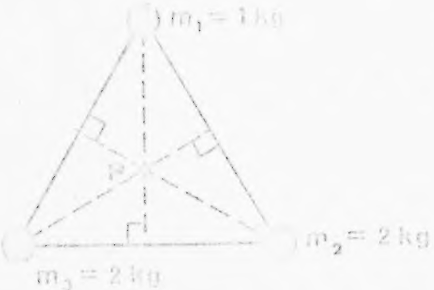
OK Computer

Answer Record

NYIT, Fall 1970

13-15.4

Three masses $m_1$, $m_2$ and $m_3$ are located at the vertices of an equilateral triangle as shown in the figure. The gravitational field strength (γ) at point P is



A. A vector directed toward $m_1$

B. A vector directed away from $m_1$

C. A vector directed toward $m_2$

D. Zero

ID# 13-15.4
TO# 041-00
Skill 1 Type
Diagram? yes
Ans: B

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

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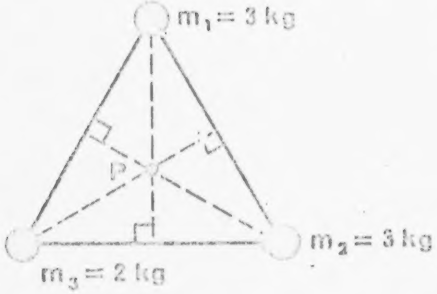
13-15.5

Three masses $m_1$, $m_2$ and $m_3$ are located at the vertices of an equilateral triangle as shown in the figure. The gravitational field strength (γ) at point P is



A. Zero

B. A vector directed toward $m_3$

C. A vector directed away from $m_3$

D. A vector directed away from $m_1$

ID# 13-15.5
TO# 041-00
Skill 1 Type
Diagram? yes
Ans: C

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

13-19.1 Consider a sphere of radius R and total mass M, having uniform density. The gravitational field strength ($\gamma$). A distance r from the center of the sphere is, assuming $r < R$

A. $\gamma = -\frac{GM}{r^2}$

B. $\gamma = -\frac{GM}{R^2}$

C. $\gamma = 0$

D. $\gamma = -\frac{GM}{R^3}r$

ID# 13-19.1
T.O.# 041-00
Skill 2
Diagram? No
Answer: D

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

13-19.2 Consider a sphere of radius R and total mass M, having uniform density. The gravitational field strength ($\gamma$) a distance r from the center of the sphere such that $r > R$ is

A. $\gamma = -\frac{GM}{R^3}r$

B. $\gamma = 0$

C. $\gamma = -\frac{GM}{r^2}$

D. $\gamma = -\frac{GM}{R^2}$

ID# 13-19.2
TO# 041-00
Skill 2 Type ____
Diagram? No
Ans: C

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

13-19.3 Consider a sphere of radius R and total mass M, having uniform density. The gravitational field strength ($\gamma$) on the surface of the sphere is

A. $\gamma = -GM/R^3$

B. $\gamma = -GM/R$

C. $\gamma = -GM/R^2$

D. $\gamma = 0$

ID# 13-19.3
IO# 041-00
Skill 2 Type
Diagram? No
Ans: C

USNA Accepts
Ques. Proofed ✓
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox

13-19.4 Consider a sphere of radius R and total mass M, having uniform density. The gravitational field strength ($\gamma$) a distance r from the center of the sphere such that r > R is

A. $\gamma = -\frac{GM}{R^3} r$

B. $\gamma = -\frac{GM}{r^3} R$

C. $\gamma = 0$

D. $\gamma = -\frac{GM}{r^2}$

ID# 13-19.4
IO# 041-00
Skill 2 Type
Diagram? No
Ans: D

USNA Accepts
Ques. Proofed

13-19.5 Consider a sphere of radius R and total mass M, having uniform density. The gravitational field strength ($\gamma$) a distance r from the center of the sphere such that r > R is

A. $\gamma = 0$

B. $\gamma = -GM/r^2$

C. $\gamma = -\frac{GM}{R^3} r$

D. $\gamma = -\frac{GM}{R^2} r$

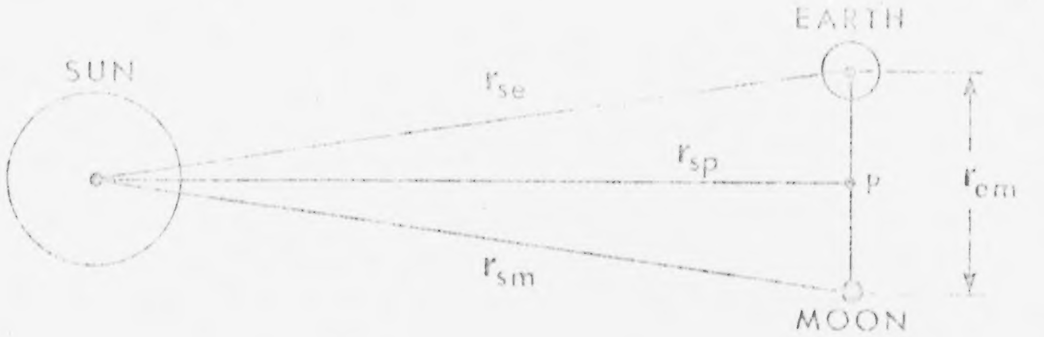
ID# 13-19.5
IO# 041-00
Skill 2 Type
Diagram? No
Ans: C

USNA Accepts
Ques. Proofed
Ques. Xeroxed

14-1.1 Refer to the diagram and assume that the Earth, sun and moon are stationary. The work required to bring a space ship of mass m to the position P (halfway between the Earth and moon) from infinity is:

$$-Gm\left(\frac{M_s}{r_{sp}} + \frac{M_e}{r_{em}} + \frac{M_m}{r_{em}}\right)$$

☐ True ☐ False



ID# 14-1.1
T.O.# 048-09
Skill 1
Diagram? yes
Answer: False

USNA Accepts ____
Ques. Proofed SN
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

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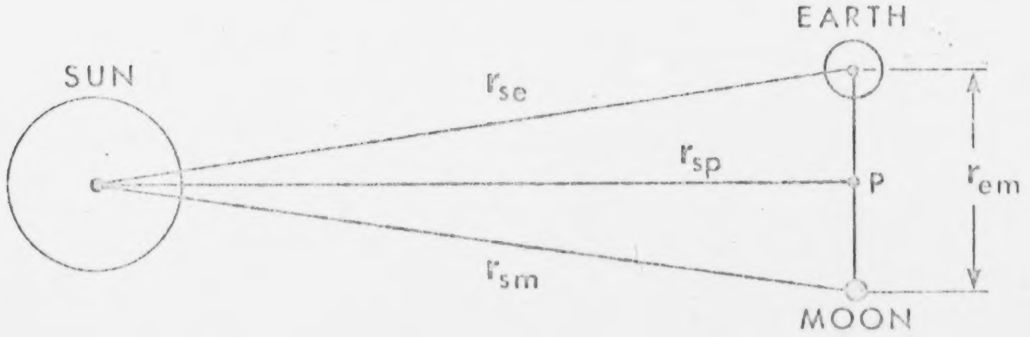
14-1.2 Refer to the diagram and assume that the Earth, sun and moon are stationary. The work required to bring a space ship of mass m from infinity to the position P (halfway between the Earth and moon) is:

$$-Gm\left(\frac{M_s}{r_{sp}} + \frac{2M_e}{r_{em}} + \frac{2M_m}{r_{em}}\right)$$

☐ True ☐ False



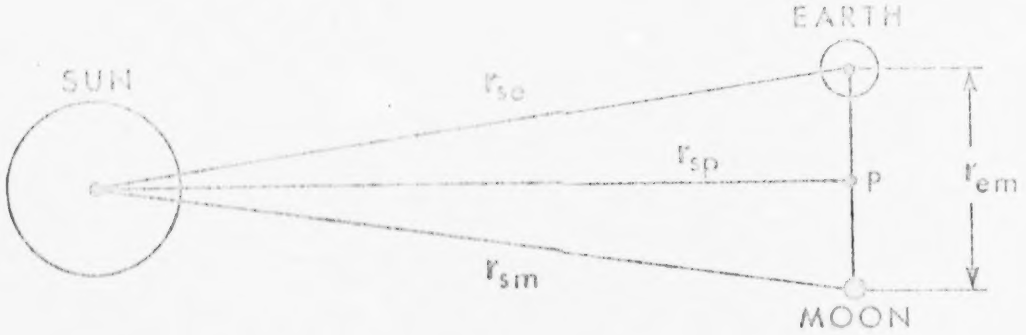
ID# 14-1.2
T.O.# 048-09
Skill 1
Diagram? yes
Answer: True

USNA Accepts ____
Ques. Proofed SN
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

14-1.3 Refer to the diagram and assume that the Earth, sun and moon are stationary. The work required to bring a space ship of mass m from infinity to a position P (halfway between the Earth and the moon) is:

$$-Gm\left(\frac{2M_s}{r_{sp}}+\frac{2M_e}{r_{em}}+\frac{2M_m}{r_{em}}\right)$$

☐ True ☐ False



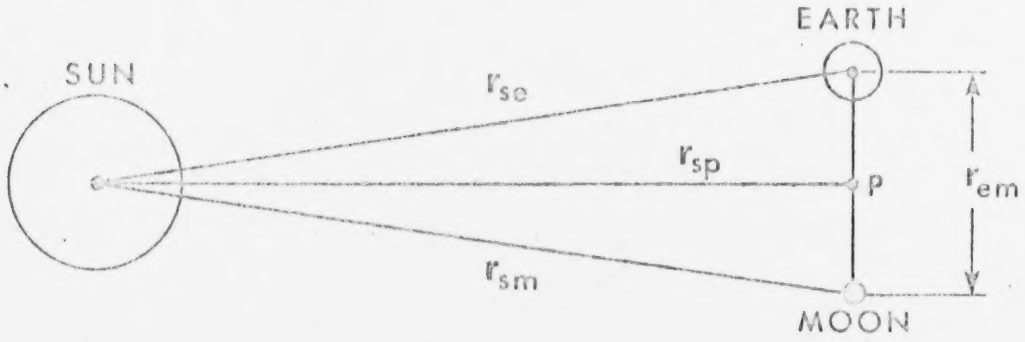
ID# 14-1.3
I.O.# 048-09
Skill Rating 1
Diagram? yes
Answer: False

USNA Accepts ____
Ques. Proofed SH
Ques. Xeroxed____
Diagram Made____
Diagram OK ____
Diagram Xerox____
To NYIT ____
To Computer____
OK Computer____
Answer Record____
NYIT, Fall 1970

14-1.4 Refer to the diagram and assume that the Earth, sun, and moon are stationary. The work required to bring a spaceship of mass m from infinity to the position P (halfway between the Earth and moon) is:

$$-Gm\left(\frac{2M_s}{r_{sp}}+\frac{2M_e}{r_{em}}+\frac{M_m}{r_{em}}\right)$$

☐ True ☐ False



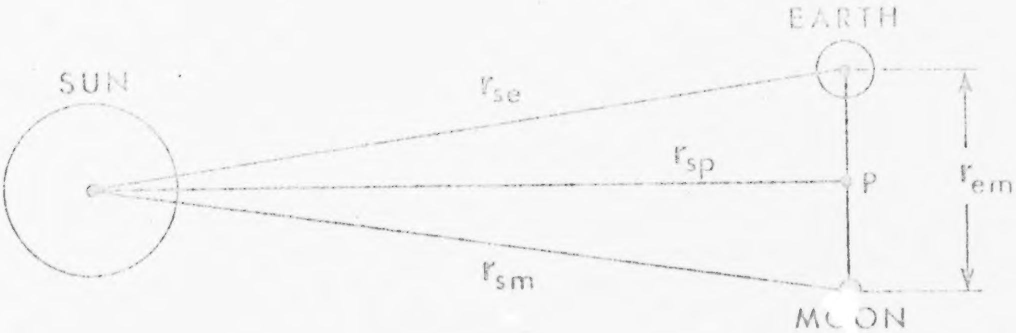
ID# 14-1.4
I.O.# 048-09
Skill Rating 1
Diagram? yes
Answer: False

USNA Accepts ____
Ques. Proofed SH
Ques. Xeroxed____
Diagram Made____
Diagram OK ____
Diagram Xerox____
To NYIT ____
To Computer____
OK Computer____
Answer Record____
NYIT, Fall 1970

14-1.5 Refer to the diagram and assume that the Earth, sun, and moon are stationary. The work required to bring a spaceship of mass m from infinity to the position P (halfway between the Earth and the moon) is:

$$-Gm\left(\frac{M_s}{r_{sp}} + \frac{M_e}{2r_{em}} + \frac{M_m}{2r_{em}}\right)$$

☐ True ☐ False



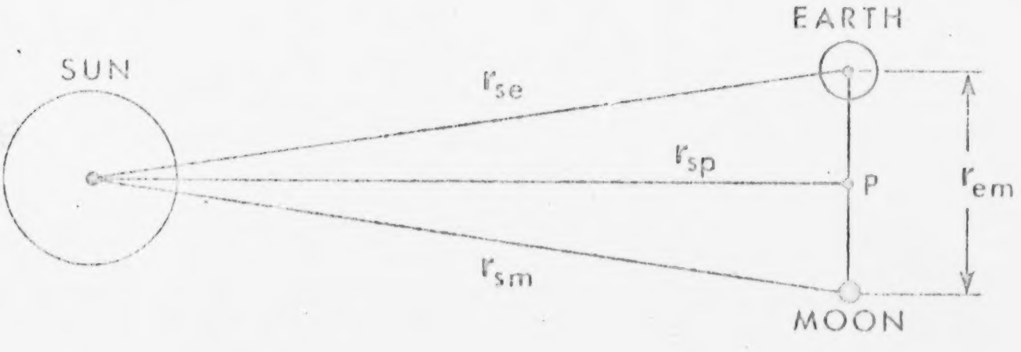
ID# 14-1.5
T.O.# 048-00
Skill Rating 1
Diagram? yes
Answer: False

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

14-6.1 The gravitational potential at the point P (halfway between the Earth and moon) is:

$$-G\left(\frac{M_s}{r_{sp}} + \frac{M_e}{r_{em}} + \frac{M_m}{r_{em}}\right)$$

☐ True ☐ False



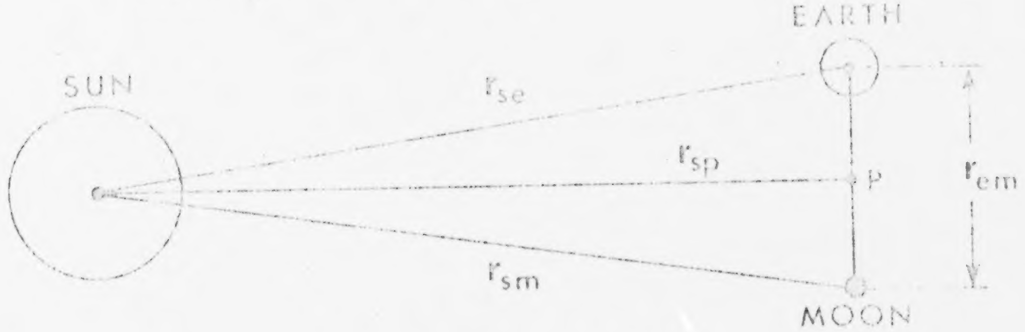
ID# 14-6.1
048-00
T.O.# 048-09
Skill 1
Diagram? Yes
Answer: False

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

14-6.2 The gravitational potential at the point P (halfway between the Earth and moon) is:

$$-G\left(\frac{M_s}{r_{sp}} + \frac{M_e}{2r_{em}} + \frac{M_m}{2r_{em}}\right)$$

☐ True ☐ False



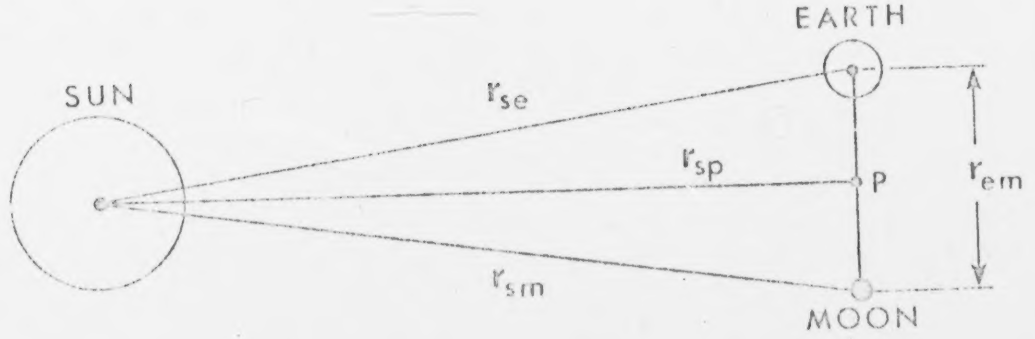
ID# 14-6.2
048-00
T.O.# 048-09
Skill 1
Diagram? Yes
Answer: False

==============
USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

14-6.3 The gravitational potential at the point P (halfway between the Earth and moon) is:

$$-G\left(\frac{M_s}{r_{sp}} + \frac{2M_e}{r_{em}} + \frac{2M_m}{r_{em}}\right)$$

☐ True ☐ False



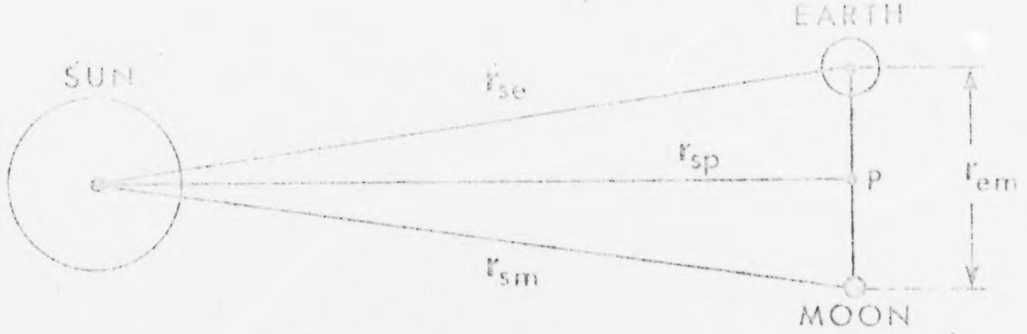
ID# 14-6.3
048-00
T.O.# 048-09
Skill 1
Diagram? Yes
Answer: True

==============
USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

14-6.4 The gravitational potential at the point P (halfway between the Earth and moon) is:

$$-G\left(\frac{2M_s}{r_{sp}} + \frac{2M_e}{r_{em}} + \frac{2M_m}{r_{em}}\right)$$

☐ True ☐ False



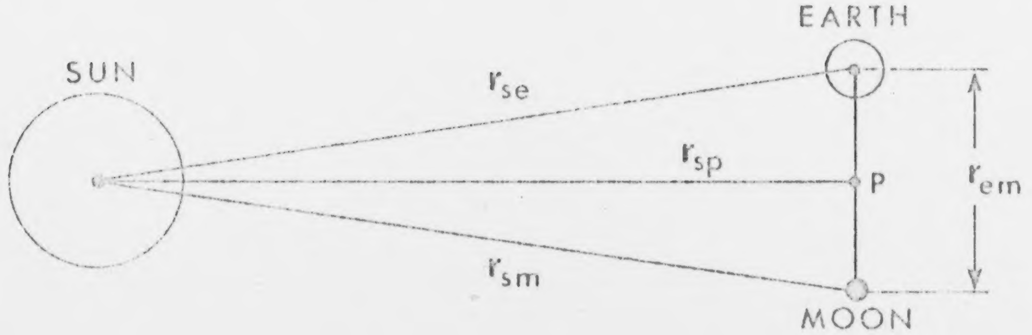
ID# 14-6.4
048-00
T.O.# 048-09
Skill 1
Diagram? Yes
Answer: False

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

14-6.5 The gravitational potential at the point P (halfway between the Earth and moon) is:

$$-G\left(\frac{2M_s}{r_{sp}} + \frac{M_e}{r_{em}} + \frac{M_m}{r_{em}}\right)$$

☐ True ☐ False



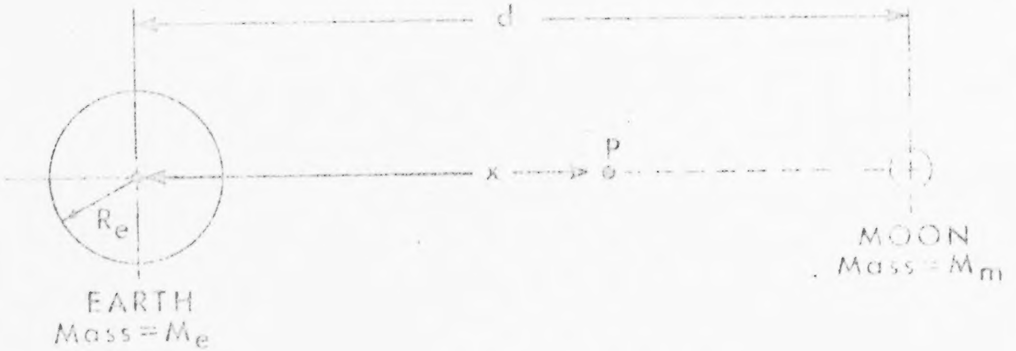
ID# 14-6.5
048-00
T.O.# 048-09
Skill 1
Diagram? Yes
Answer: False

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

14-10.1 Suppose that the Earth-moon system shown in the diagram is stationary and isolated from the rest of the universe, and that the gravitational field at the point P is zero. In order to be "captured" at point P, a rocket aimed directly at the moon would have to leave the Earth's surface with the speed:

$$v_o = \left[2G\left(\frac{M_m}{d-x} + \frac{M_e}{x}\right)\right]^{\frac{1}{2}}$$

☐ True ☐ False



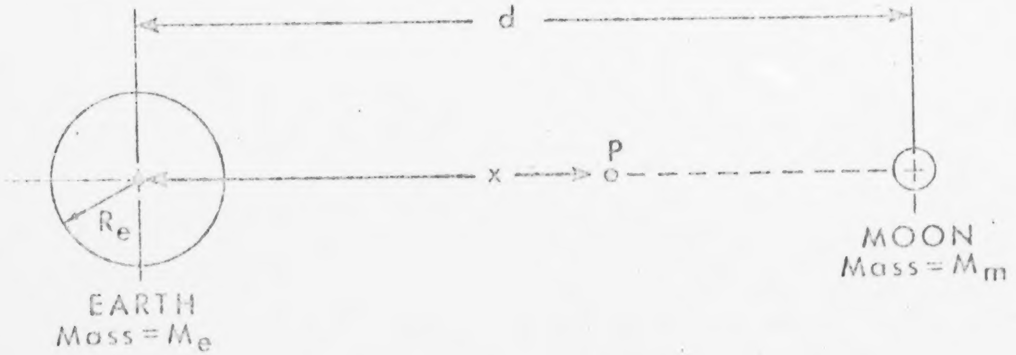
ID# 14-10.1
T.O.# 048-07
Skill 1
Diagram? Yes
Answer: False

USNA Accepts ____
Ques. Proofed SW
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

14-10.2 Suppose that the Earth-moon system shown in the diagram is stationary and isolated from the rest of the universe, and that the gravitational field at the point P is zero. In order to be "captured" at point P, a rocket aimed directly at the moon would have to leave the Earth's surface with the speed:

$$v_o = \left[2G\left(\frac{M_m}{d-x} + \frac{M_e}{x} - \frac{M_e}{Re}\right)\right]^{\frac{1}{2}}$$

☐ True ☐ False



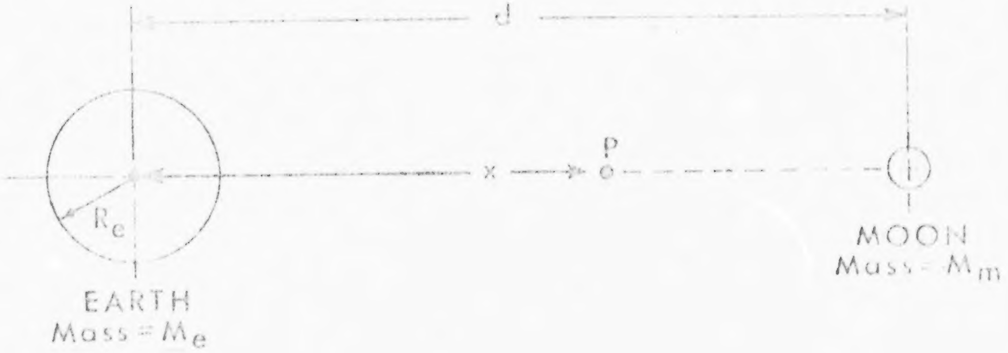
ID# 14-10.2
T.O.# 048-07
Skill 1
Diagram? Yes
Answer: False

USNA Accepts ____
Ques. Proofed SA
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

14-10.3 Suppose that the Earth-moon system shown in the diagram is stationary and isolated from the rest of the universe, and that the gravitational field at the point P is zero. In order to be "captured" at point P, a rocket aimed directly at the moon would have to leave the Earth's surface with the speed:

$$v_o = \left[G\left(\frac{M_m}{d-x} + \frac{M_e}{x} - \frac{M_e}{Re} - \frac{M_m}{d-Re}\right)\right]^{\frac{1}{2}}$$

☐ True ☐ False



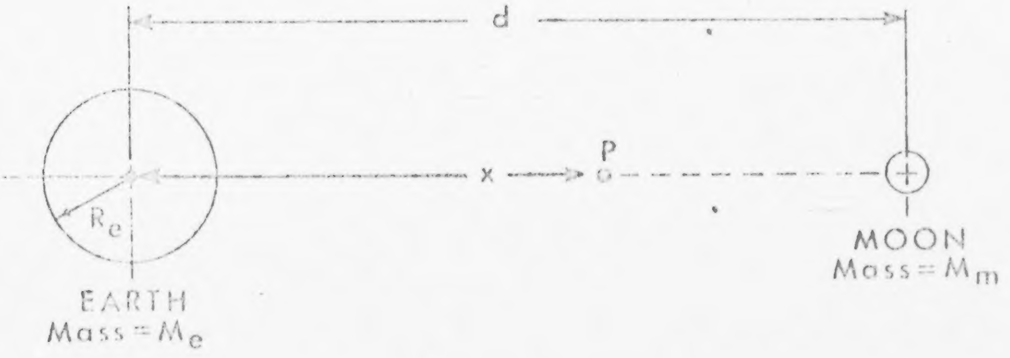
ID# 14-10.3
T.O.# 048-07
Skill 1
Diagram? Yes
Answer: False

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

14-10.4 Suppose that the Earth-moon system shown in the diagram is stationary and isolated from the rest of the universe, and that the gravitational field at the point P is zero. In order to be "captured" at point P, a rocket aimed directly at the moon would have to leave the Earth's surface with the speed:

$$v_o = \left[G\left(\frac{M_m}{d-Re} - \frac{M_m}{d-x} + \frac{M_e}{Re} - \frac{M_e}{x}\right)\right]^{\frac{1}{2}}$$

☐ True ☐ False



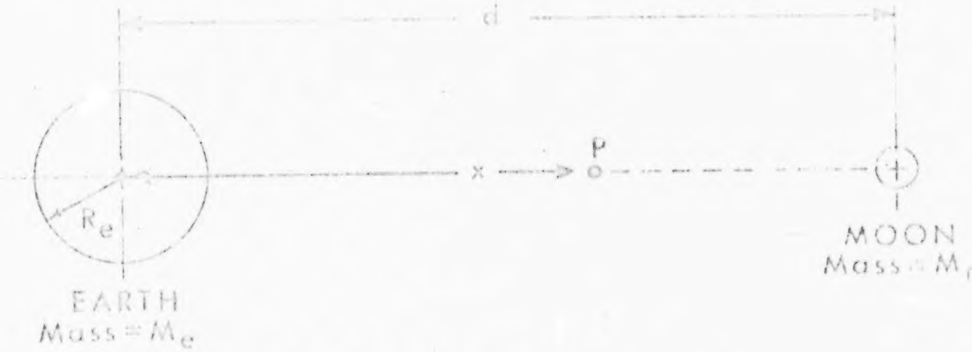
ID# 14-10.4
T.O.# 048-07
Skill 1
Diagram? Yes
Answer: False

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

14-10.5 Suppose that the Earth-moon system shown in the diagram is stationary and isolated from the rest of the universe, and that the gravitational field at the point P is zero. In order to be "captured" at point P, a rocket aimed directly at the moon would have to leave the Earth's surface with the speed:

$$v_o = \left[2G\left(\frac{M_e}{R_e} + \frac{M_m}{d-R_e} - \frac{M_e}{x} - \frac{M_m}{d-x}\right)\right]^{\frac{1}{2}}$$

☐ True ☐ False



ID# 14-10.5
T.O.# 048-07
Skill 1
Diagram? Yes
Answer: True

USNA Accepts ____
Ques. Proofed SV
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

14-14.1 At what altitude above the Earth's surface is the escape velocity (speed) from the Earth equal to 8 km/sec? (Take the Earth's radius as 6400 km and its mass as $6 \times 10^{24}$ kg).

ID# 14-14.1
T.O.# 048-07
Skill 2
Diagram? No
Answer: 6,100 km

14-14.2 At what altitude above the Earth's surface is the escape velocity (speed) from the Earth equal to 11 km/sec? (Take the Earth's radius as 6,400 km and its mass as $6 \times 10^{24}$ kg).

ID# 14-14.2
T.O.# 048-07
Skill 2
Diagram? No
Answer: 210 km

USNA Accepts ____
Ques. Proofed SV
Ques. Xeroxed ____
Diagram Made ____

14-14.3 At what altitude above the Earth's surface is the escape velocity (speed) from the Earth equal to 9 km/sec? (Take the Earth's radius as 6,400 km and its mass as $6 \times 10^{24}$ kg).

ID# 14-14.3

T.O. # 048-07

Skill 2

Diagram? No

Answer: 3,480 km

===============

USNA Accepts ____

Ques. Proofed GA

Ques. Xeroxed ____

14-14.4 At what altitude above the Earth's surface is the escape velocity (speed) from the Earth equal to 7 km/sec? (Take the Earth's radius as 6,400 km, its mass as $6 \times 10^{24}$ kg.)

ID# 14-14.4

T.O. # 048-07

Skill 2

Diagram? No

Answer: 9,900 km

===============

USNA Accepts ____

Ques. Proofed GN

14-14.5 (Take the Earth's radius as 6,400 km and its mass as $6 \times 10^{24}$ kg). What is the escape velocity (speed) from the Earth at an altitude of 1,600 km above the Earth's surface? (Give answer in km/sec.)

ID# 14-14.5

T.O. # 048-07

Skill 2

Diagram? No

Answer: 10 km/sec

===============

USNA Accepts ____

Ques. Proofed GA

Ques. Xeroxed ____

Diagram Made ____

Diagram OK ____

Diagram Xerox ____

To NYIT ____

To Computer ____

19-1.1 If a particle has a neutral charge it must have an equal number of positive and negative charges.

☐ True ☐ False

ID# 19-1.1
TO# 049-00
Skill 0 Type
Diagram? no
Ans: True

19-1.2 The presence of an electrical force signifies an imbalance of charge in the form of a positive to negative ratio greater than one.

☐ True ☐ False

ID# 19-1.2
TO# 049-00
Skill 0 Type
Diagram? no
Ans: False

19-1.3 The electrical force between a positive and a negative charge is a force of attraction.

☐ True ☐ False

ID# 19-1.3
TO# 049-00
Skill 0 Type
Diagram? no
Ans: True

USNA Accepts
Ques. Proofed SN
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

19-1.4 A smallest amount of negative charge that can exist is the charge on one electron.

☐ True ☐ False

ID# 19-1.4
TO# 049-00
Skill 0 Type___
Diagram? no
Ans: True

---

19-1.5 The electrical force between two like charges is a force of attraction.

☐ True ☐ False

ID# 19-1.5
TO# 049-00
Skill 0 Type___
Diagram? no
Ans:___

USNA Accepts ___
Ques. Proofed SA
Ques. Xeroxed___

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19-2.1 Which of the following charges could a particle have?

A. $2.4 \times 10^{-19}$ coul

B. $4.0 \times 10^{-19}$ coul

C. $5.6 \times 10^{-19}$ coul

D. $6.4 \times 10^{-19}$ coul

E. $7.2 \times 10^{-19}$ coul

ID# 19-2.1
TO# 049-06
Skill 1 Type___
Diagram? no
Ans: D

USNA Accepts ___
Ques. Proofed S
Ques. Xeroxed___
Diagram Made___
Diagram OK ___
Diagram Xerox ___
To NYIT ___
To Computer

19-2.2 A particle could not have which of the following charges?

A. $16 \times 10^{-19}$ coul

B. $32 \times 10^{-19}$ coul

C. $1.6 \times 10^{-19}$ coul

D. $3.2 \times 10^{-19}$ coul

E. $4.0 \times 10^{-19}$ coul

ID# 19-2.2
TO# 049-01
Skill / Type
Diagram? no
Ans: E

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK

19-2.3 The absolute value of the charge on a paticle which contains eight electrons and ten protons is

A. $12.8 \times 10^{-19}$ coul

B. $16.0 \times 10^{-19}$ coul

C. $3.2 \times 10^{-19}$ coul

D. $28.8 \times 10^{-19}$ coul

E. $8.0 \times 10^{-19}$ coul

ID# 19-2.3
TO# 049-06
Skill / Type
Diagram? no
Ans:

USNA Accepts
Ques. Proofed

19-2.4 A particle having a charge with a magnitude of $8.0 \times 10^{-18}$ coul must have

A. fifty excess protons

B. fifty excess electrons

C. fifty excess neutrons

D. fifty excess protons or fifty excess electrons

E. fifty excess protons and fifty excess electrons

ID# 19-2.4
TO# 049-02
Skill 8 Type
Diagram? no
Ans: D

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made

19-2.5 Which of the following statements are false?

A. The magnitude of the charge on a single electron is $1.6 \times 10^{-19}$ coul.

B. The magnitude of the charge on a single proton is $1.6 \times 10^{-19}$ coul.

C. The magnitude of the charge on a single neutron is zero.

D. The magnitude of the charge on one proton and one electron together is $3.2 \times 10^{-19}$ coul.

ID# 19-2.5
TO# 049-02
Skill 0 Type ___
Diagram? no
Ans: D

USNA Accepts ___
Ques. Proofed SN
Ques. Xeroxed ___
Diagram Made ___
Diagram OK ___
Diagram Xerox ___

19-5.1 An ideal insulator is one which has an abundance of free electrons.

☐ True ☐ False

ID# 19-5.1
TO# 050-00
Skill 0 Type ___
Diagram? no
Ans: False

USNA Accepts ___
Ques. Proofed SN
Ques. Xeroxed ___

19-5.2 In an ideal insulator, it is the positive charge which moves.

☐ True ☐ False

ID# 19-5.2
TO# 050-00
Skill 0 Type ___
Diagram? no
Ans: False

USNA Accepts ___
Ques. Proofed SN

19-5.3 When charges are deposited on an insulator the charges will spread over the entire surface.

☐ True ☐ False

ID# 19-5.3
TO# 050-00
Skill 0 Type
Diagram? no
Ans: False

USNA Accepts
Ques. Proofed SA
Ques. Xeroxed

19-5.4 Electric charges are not free to move through the material of an insulator.

☐ True ☐ False

ID# 19-5.4
TO# 050-00
Skill 0 Type
Diagram? no
Ans: True

USNA Accepts
Ques. Proofed SA
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox

19-5.5 There are no perfect insulators but, for many practical purposes, some materials behave as if they were perfect insulators.

☐ True ☐ False

ID# 19-5.5
TO# 050-00
Skill 0 Type
Diagram? no
Ans: TRUE

USNA Accepts

19-6.1 Two uncharged metal spheres are close to each other but are not in contact. First one sphere and then the other is touched with a hard rubber rod which has been stroked with fur. Which of the following can now be said about the spheres?

A. The spheres will attract one another.

B. The spheres will repel one another.

C. One sphere will be positively charged and one negatively charged.

D. The spheres will remain uncharged.

ID# 19-6.1
TO# 050-00
Skill 0 Type
Diagram? no
Ans: B

USNA Accepts
Ques. Proofed SA
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox

19-6.2 Two uncharged spheres are in contact. A hard rubber rod is stroked with fur and brought in contact with one sphere, then removed. The spheres are then separated. Which of the following can now be said about the metal spheres?

A. The spheres will attract one another.

B. The spheres will be positively charged.

C. One sphere will be negatively charged and one positively charged.

D. The spheres will repel one another.

ID# 19-6.2
TO# 050-00
Skill 0 Type
Diagram? no
Ans: D

USNA Accepts

19-6.3 Two hard rubber rods are rubbed with the same piece of fur and then brought into close proximity. Which of the following can be said about the two rods?

A. The rods will attract one another.

B. The rods will be negatively charged.

C. The rods will be positively charged.

D. Only the first rod rubbed will be charged.

ID# 19-6.3
TO# 050-00
Skill 0 Type
Diagram? no
Ans: B

USNA Accepts
Ques. Proofed SA
Ques. Xeroxed
Diagram Made

19-6.4 Two metal spheres are initially uncharged. One sphere is touched with a rubber rod which had been rubbed with fur and the other sphere is touched with a glass rod which had been rubbed with a silk cloth. Which of the following can now be said about the two spheres?

A. The spheres will be positively charged.

B. The spheres will be negatively charged.

C. The spheres will attract one another.

D. The spheres will repel one another.

ID# 19-6.4

TO# 050:00

Skill 0 Type

Diagram? no

Ans: C

USNA Accepts

Ques. Proofed [illegible]

Ques. Xeroxed

Diagram Made

Diagram OK

Diagram Xerox

To MYIT

19-6.5 Two uncharged metal spheres one large and one small are in contact. A hard rubber rod is stroked with fur and brought very near to one of the two metal spheres (no contact between rod and sphere). The spheres are then separated, and the rod removed from the vicinity. Which of the following can now be said about the metal spheres?

A. The larger sphere will acquire the most charge

B. Both spheres will be positively charged.

C. Both spheres will be negatively charged.

D. The magnitude of charge on each sphere will be the same.

ID# 19-6.5

TO# 050:00

Skill 0 Type

Diagram? no

Ans: D

USNA Accepts

Ques. Proofed [illegible]

Ques. Xeroxed

19-11.1 Two positive charges $q_1$ and $q_2$ are located on the x-axis at $x = 0$ and $x = 1.0$ meter respectively. If $q_1 = 4\ q_2$, at what point on the x-axis is the resultant force on an electron equal to zero?

A. $x = 2/3$ meter
B. $x = 4/5$ meter
C. $x = 1/2$ meter
D. $x = 1/3$ meter
E. There is no point on the x-axis where the resultant force is zero.

ID# 19-11.1

TO# 049:00

Skill 2 Type

Diagram? no

Ans: A

USNA Accepts

19-11.2 Two negative charges $q_1$ and $q_2$ are located on the x-axis at $x = 0$ and $x = 2.0$ meters respectively. If $q_1 = 4\ q_2$, at what point on the x-axis is the resultant force on an electron equal to zero?

A. $x = 2/3$ meter
B. $x = 8/5$ meter
C. $x = 3/4$ meter
D. $x = 4/3$ meter
E. There is no point on the x-axis where the resultant force is zero.

ID# 19-11.2
049-00
Skill 2 Typ
Diagram? no
Ans. D

USNA Accepts
Ques. Proofed SN
Ques. Xeroxed
Diagram Made

19-11.3 Two charges are located on the x-axis. $+4\ q$ is at $x = 0$ and $-q$ is at $x = 1.0$ meter. At what point on the x-axis is the resultant force on an electron equal to zero?

A. $x = 1.25$ m
B. $x = 2.00$ m
C. $x = 1.33$ m
D. $x = 0.67$ m
E. There is no point on the x-axis where the resultant force is zero.

ID# 19-11.3
TO# 049-00
Skill 2 Type
Diagram? no
Ans: B

USNA Accepts
Ques. Proofed SN
Ques. Xeroxed
Diagram Made
Diagram OK

19-11.4 Two unlike charges +q and -q are located 1.5 meters apart. If the magnitudes of both charges are doubled, how far apart must the charges be located if they are to have the same force of attraction as before?

A. 1.5 m
B. 2.0 m
C. 2.5 m
D. 3.0 m
E. 3.5 m

ID# 19-11.4
TO# 049-00
Skill 2 Type
Diagram? no
Ans: D

USNA Accepts

19-11.5 Two charges $q_1$ and $q_2$ located 6.0 cm apart have a force of attraction F. The two charges are moved to a distance of 2.0 cm apart and have a force of attraction, F'. What is the ratio of the two forces F'/F?

A. 1/9
B. 1/3
C. 3
D. 6
E. 9

ID# 19-11.5
TO# 049-00
Skill 2 Type
Diagram? no
Ans: E

USNA Accepts
Ques. Proofed SN
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

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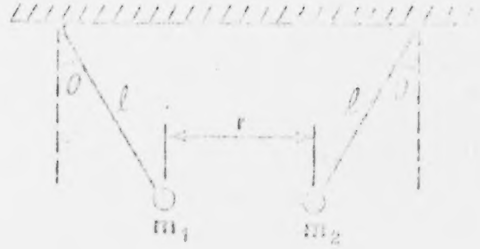
19-15.1



In the diagram, two equally charged balls (one positive and one negative) are suspended by weightless strings of equal length, which make an angle of θ = 20° with the vertical. The two balls of mass $m_1 = m_2 = 2.0$ gram are separated by a distance r = .30 meter. What is the charge in coulombs on each of the balls?

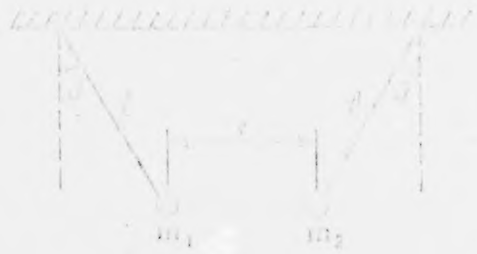
$|q|$ = ______________________

ID# 19-15.1
TO# 052-00
Skill 2 Type
Diagram? yes
Ans:

on the back of card

USNA Accepts
Ques. Proofed SN
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

19-15.2



In the diagram, two equally charged balls are suspended by weightless strings of equal length, which make an angle of $\theta = 30°$ with the vertical. The two balls of mass $m_1 = m_2 = 1.0$ gm have charges of plus and minus $3.2 \times 10^{-7}$ coulomb respectively. By what distance, r, are the two masses separated?

____________________

ID# 19-15.2
TO# 052-00
Skill 2 Type ___
Diagram? yes
Ans: ________
r = .40 meters
(.41 m - .39 m)

USNA Accepts ___
Ques. Proofed SN
Ques. Xeroxed ___
Diagram Made ___
Diagram OK ___
Diagram Xerox ___
To NYIT ___
To Computer ___
OK Computer ___
Answer Record ___
NYIT, Fall 1970

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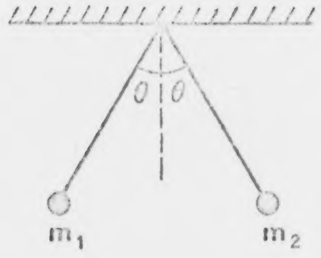
19-15.3



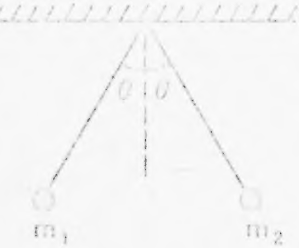
In the diagram, two equally charged balls are suspended from a common point by weightless strings of equal length, which make an angle $\theta = 30°$ with the vertical. The masses $m_1 = m_2 = 4.0$ grams are 0.4 meter apart. What is the magnitude of the charge in coulombs on each ball?

$|q| =$ ________________

ID# 19-15.3
TO# 052-00
Skill 2 Type
Diagram? yes
Ans: ________
$6.4 \times 10^{-7}$ coul
(6.5 - 6.3 coul)

USNA Accepts ___
Ques. Proofed SN
Ques. Xeroxed ___
Diagram Made ___
Diagram OK ___
Diagram Xerox ___
To NYIT ___
To Computer ___
OK Computer ___
Answer Record ___
NYIT, Fall 1970

19-15.4



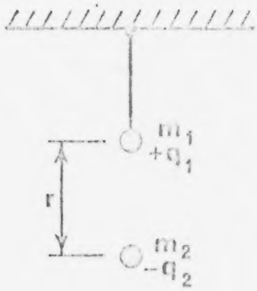
ID# 19-15.4
TO# 052-00
Skill 2 Type
Diagram? yes
Ans: .434 m
(.444 m - .424 m)

USNA Accepts
Ques. Proofed SN
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 19

In the diagram, two equally charged balls are suspended from a common point by weightless strings of equal length which make an angle of $\theta = 45°$ with the vertical. The masses $m_1 = m_2 = 2.0$ gram each have a charge of $6.4 \times 10^{-7}$ coulomb. By what distance, r, are the two balls separated?

r = ______________

19-15.5



ID# 19-15.5
TO# 052-00
Skill 2 Type
Diagram? yes
Ans: $1.96 \times 10^{-2}$ nt

USNA Accepts
Ques. Proofed SN
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

In the diagram, two masses $m_1 = m_2 = 1.0$ gram have charges with equal magnitudes, $q_1 = -q_2$. Mass, $m_1$, is supported by a light inextensible string. When mass, $m_2$, is brought to a point $r = 0.1$ meter directly below $m_1$, it is suspended there by the coulomb force of attraction. What, then, will be the tension in newtons in the string supporting $m_1$?

T = ______________

20-1.1 A particle with a charge of $-3.92 \times 10^{-5}$ coulomb remains at rest when placed in a downward-directed electric field of strength 500 nt/coul. The mass of the particle in kg is

A. $1.30 \times 10^{6}$

B. $4.00 \times 10^{5}$

C. $2.00 \times 10^{-3}$

D. $6.13 \times 10^{-4}$

ID# 20-1.1
TO# 052-00
Skill 2 Type___
Diagram? no
Ans: C

USNA Accepts ___
Ques. Proofed ___
Ques. Xeroxed___

20-1.2 A particle of mass 3.00 gm remains stationary in a downward-directed electric field of 600 nt/coul. The charge on the particle is, in coulombs

A. $+1.6 \times 10^{-4}$

B. $-1.6 \times 10^{-4}$

C. $+4.9 \times 10^{-5}$

D. $-4.9 \times 10^{-5}$

ID# 20-1.2
TO# 052-00
Skill 2 Type___
Diagram? no
Ans: D

USNA Accepts ___
Ques. Proofed___

20-1.3 A particle of mass 3.00 gm and charge $+4.9 \times 10^{-5}$ coulombs remains stationary in an electric field. The electric field strength is, in nt/coul

A. 1960, directed upward
B. 1960, directed downward
C. 600, directed upward
D. 600, directed downward

ID# 20-1.3
TO# 052-00
Skill 2 Type___
Diagram? no
Ans: C

USNA Accepts ___
Ques. Proofed ___
Ques. Xeroxed___
Diagram Made___
Diagram OK ___
Diagram Xerox ___

20-1.4 A particle of mass 8.00 gm and charge $-1.96 \times 10^{-4}$ coulombs remains stationary in an electric field. The electric field strength is, in nt/coul

A. 1300 - directed upward
B. 1300 - directed downward
C. 400 - directed upward
D. 400 - directed downward

ID# 20-1.4
TO# 052-00
Skill 2 Type
Diagram? no
Ans: D

USNA Accepts
Ques. Proofed
Ques. Xeroxed

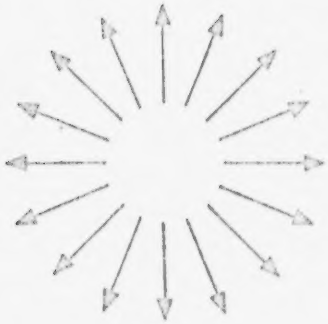
20-1.5 A particle of mass 8.00 gm and charge $+4.9 \times 10^{-5}$ coulombs remains stationary in an electric field. The electric field strength is, in nt/coul

A. 600 - directed upward
B. 600 - directed downward
C. 5120 - directed upward
D. 5120 - directed downward

ID# 20-1.5
TO# 052-00
Skill 2 Type
Diagram? no
Ans: A

USNA Accepts
Ques. Proofed

20-5.1



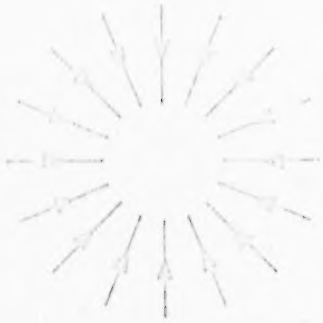
A portion of the electric field line diagram (above) has been erased. The choice below, most likely responsible for the illustrated field is

A. A single negative charge
B. A single positive charge
C. Two positive charges
D. Two negative charges

ID# 20-5.1
TO# 055-00
Skill 0 Type
Diagram? yes
Ans: B

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox

20-5.2



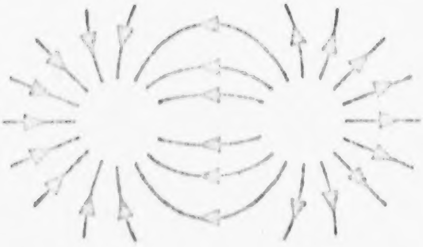
A portion of the electric field line diagram (above) has been erased. The choice below, most likely responsible for the illustrated field is

A. A single negative charge
B. A single positive charge
C. Two positive charges
D. Two negative charges

ID# 20-5.2
TO# 055-00
Skill 0 Type
Diagram? yes
Ans: A

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

20-5.3



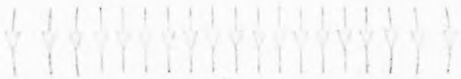
A portion of the electric field line diagram (above) has been erased. The choice below, most likely responsible for the illustrated field is

A. A single positive charge
B. A single negative charge
C. A positive and a negative charge
D. An irregular shape, positively charged

ID# 20-5.3
TO# 055-00
Skill 0 Type
Diagram? yes
Ans: C

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

20-5.4



A portion of the electric field line diagram (above) has been erased. The choice below, most likely responsible for the illustrated field is

A. Two oppositely charged metal plates
B. Two positively charged metal plates
C. An irregular shape, negatively charged
D. An irregular shape, positively charged

ID# 20-5.4
TO# 055-00
Skill 0 Type
Diagram? yes
Ans: A

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

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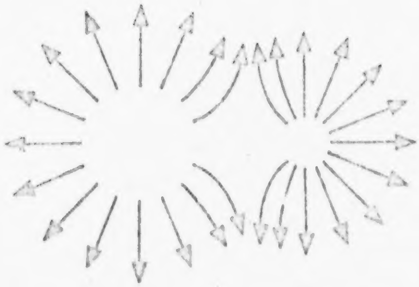
20-5.5



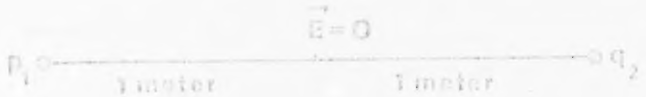
A portion of the electric field line diagram (above) has been erased. The choice below, most likely responsible for the illustrated field is

A. Two positive charges
B. An irregular shape, positively charged
C. An irregular shape, negatively charged
D. A positive and a negative charge, of unequal magnitude

ID# 20-5.5
TO# 055-00
Skill 0 Type
Diagram? yes
Ans: B

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

20-9.1



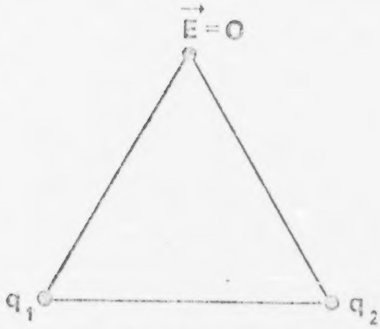
Two point charges $q_1$ and $q_2$ are two meters apart. The electric field intensity on the line joining the two charges and midway between them is zero. The ratio $q_1/q_2$ is

A. 1
B. $\sqrt{3}$
C. −3
D. +3

ID# 20-9.1
TO# 053-00
Skill 2 Type
Diagram? yes
Ans: A

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

20-9.2



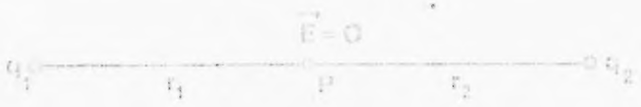
Two point charges $q_1$ and $q_2$ are located at the vertices of an equilateral triangle. The electric field intensity at the third vertex is zero. The ratio $q_1/q_2$ is

A. 1/2
B. 1
C. $\sqrt{3}/2$
D. 0

ID# 20-9.2
TO# 053-00
Skill 2 Type
Diagram? yes
Ans: B

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

20-9.3



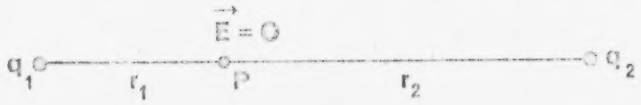
Point P lies on the line joining point charges $q_1$ and $q_2$. The electric intensity at point P is zero, and the distances from $q_1$ and $q_2$ to point P are $r_1$ and $r_2$ respectively. If the ratio $q_1/q_2 = +2$ the ratio $r_1/r_2$ is

A. 0.5
B. 2.0
C. $\sqrt{2}$
D. $\sqrt{2}/2$

ID# 20-9.3
TO# 053-00
Skill 2 Type
Diagram? yes
Ans: C

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

20-9.4



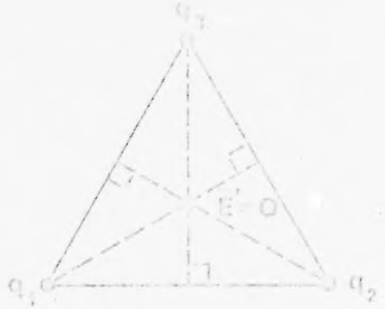
Point P lies on the line joining point charges $q_1$ and $q_2$. The electric intensity at point P is zero, and the distances from $q_1$ and $q_2$ to point P are $r_1$ and $r_2$ respectively. If the ratio $r_2/r_1 = 2$ the ratio $q_2/q_1$ is

A. 0.25
B. 0.50
C. 2
D. 4

ID# 20-9.4
TO# 053-00
Skill 2 Type
Diagram? yes
Ans: D

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

20-9.5



Point charges $q_1$, $q_2$ and $q_3$ are located at the vertices of an equilateral triangle. All of the charges are of the same sign. The electric intensity at a point equidistant from each charge is zero. If the ratio $q_1/q_2 = 1$ the ratio $q_3/q_1$ is

A. 1
B. 2
C. $\sqrt{3}$
D. $2\sqrt{3}$

ID# 20-9.5
TO# 053-00
Skill 2 Type
Diagram? yes
Ans: A

USNA Accepts
Ques. Proofed lh
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

21-1.1 An infinitely long wire has a charge density of $\lambda$. When a point charge $Q = +6.0 \times 10^{-6}$ coul is imbedded in this wire, the electric field is measured to be zero at all points on a circle of radius 2.0 meters perpendicular to the axis of the wire and centered at Q. What is the charge density $\lambda$ of the wire?

$\lambda$ = ____________ coul/m

ID# 21-1.1
TO# 053-00
Skill 2 Type
Diagram? no
Ans: $-1.5 \times 10^{-6}$

USNA Accepts ?
Ques. Proofed SN
If revised after student use:
Date:
New Card used?
NYIT, Fall 1970

21-1.2 An infinitely long wire has a charge density of $\lambda = +2.0 \times 10^{-6}$ coul/m. When a point charge $Q = -6.0 \times 10^{-6}$ coul is embedded in this wire the electric is zero at all points on a circle of radius r, perpendicular to the axis of the wire and centered at Q. What is the radius r of the circle?

r = __________ m

ID# 21-1.2

TO# 053-00

Skill 2 Type____

Diagram? no

Ans: 1.5

USNA Accepts

21-1.3 An infinitely long wire has a uniform charge density of $\lambda = +3.0 \times 10^{-6}$ coul/m. When a point charge Q is placed at a point located 1.5 m perpendicular to the wire there is a point 3.0 m perpendiucular to the wire at which the electric field is zero. What is the charge Q?

Q = __________ coul

ID# 21-1.3

TO# 053-00

Skill 2 Type____

Diagram? no

Ans: $-4.5 \times 10^{-6}$

21-1.4 An infinitely long wire has a uniform charge density of $-2.0 \times 10^{-6}$ coul/m. When a point charge Q is placed at a point located 3.0 m perpendicular to the wire, the electric field at the point halfway between the wire and the point charge Q is zero. What is the charge Q?

Q = __________ coul

ID# 21-1.4

TO# 053-00

Skill 2 Type____

Diagram? no

Ans: $-6.0 \times 10^{-6}$

USNA Accepts____

Ques. Proofed SI

21-1.5 An infinitely long wire has a charge density of λ coul/m. When a point charge $Q = 4.0 \times 10^{-6}$ coul is placed at a point 2.0 m perpendicular to the wire, the electric field at the point halfway between the wire and the point charge Q is zero. What is the charge density λ of the wire?

λ = ________ coul/m

ID# 21-1.5
TO# 052-00
Skill 2 Type ____
Diagram? no
Ans: $2.0 \times 10^{-6}$

21-5.1 Two large parallel metal plates adjacent to one another carry uniform surface charge densities of $+\sigma$ and $-\sigma$, respectively, on their inner surfaces. When a charge $q = 6.0 \times 10^{-6}$ coul is placed between the plates, it experiences a force of magnitude $F = 6.78 \times 10^{5}$ nt. What is the magnitude of the charge density σ?

σ = ________ coul/m$^2$

ID# 21-5.1
TO# 052-00
Skill 2 Type ____
Diagram? no
Ans: 10.0

21-5.2 Two large parallel metal plates adjacent to one another carry uniform surface charge densities of $+\sigma$ and $-\sigma$, respectively, on their inner surfaces. The magnitude of σ is 5.0 coul/m$^2$. When a charge, q, is placed between the two plates, it experiences a force of magnitude F = 
What is the magnitude of the charge q?

q = ________ coul

ID# 21-5.2
TO# 052-00
Skill 2 Type ____
Diagram? no
Ans: $4.0 \times 10^{-6}$

USNA Accepts ____
Ques. Proofed ____

21-5.3 An infinitely large metal plate has a surface charge density of $\sigma = 2.0$ coul/m$^2$. A charge $q = 3.98 \times 10^{-5}$ coul is placed 5.0 cm from the plate. What is the magnitude of the electric force on it?

F = ________ nt

ID# 21-5.3
TO# 052-00
Skill 2 Type ____
Diagram? no
Ans: $4.5 \times 10^6$

21-5.4 An infinitely large metal plate has a surface charge density of $\sigma = 15$ coul/m$^2$. When a charge q is placed 5.0 cm from the plate, it experiences a force of magnitude $F = 5.0 \times 10^6$ nt. What is the magnitude of the charge q?

q = ________ coul

ID# 21-5.4
TO# 052-00
Skill 2 Type ____
Diagram? no
Ans: $5.9 \times 10^{-6}$

21-5.5 An infinitely large metal plate has a surface charge density $\sigma$. When a charge $q = 3.0 \times 10^{-6}$ coul is placed 5.0 cm from the plate it experiences a force of magnitude $F = 5 \times 10^5$ nt. What is the magnitude of the charge density $\sigma$?

$\sigma$ = ________ coul/m$^2$

ID# 21-5.5
TO# 052-00
Skill 2 Type ____
Diagram? no
Ans: 2.95

21-10.1 Two oppositely charged metal plates are placed parallel to one another. The uniform electric field between the plates has an intensity of $1.0 \times 10^3$ nt/coul. If a proton is released very close to the positive plate it has a kinetic energy of $3.2 \times 10^{-19}$ joule at the instant it collides with the negative plate. By what distance are the plates separated?

d = ________ m

ID# 21-10.1
TO# 053-00
Skill 2 Type ____
Diagram? no
Ans: $2.0 \times 10^{-3}$

21-10.2 Two oppositely charged metal plates are placed parallel to one another separated by a distance of $5.0 \times 10^{-3}$ m. If a proton is released very close to the positive plate it has a kinetic energy of $8.0 \times 10^{-19}$ joule at the instant it collides with the negative plate. What is the magnitude of the intensity of the uniform electric field between the two plates?

E = ____________ nt/coul

ID# 21-10.2

TO# 053-00

Skill 2 Type .

Diagram? no

Ans: $1.0 \times 10^{3}$

USNA Accepts____

Ques. Proofed____

21-10.3 Two oppositely charged metal plates are placed parallel to one another separated by a distance of $2.0 \times 10^{-3}$ m. The uniform electric field between the plates has an intensity of $3.0 \times 10^{3}$ nt/coul. If an electron is released very close to the negative plate, what will be its kinetic energy at the instant it collides with the positive plate?

K = ____________ joule

ID# 21-10.3

TO# 053-00

Skill 2 Type____

Diagram? no

Ans: $9.6 \times 10^{-19}$

21-10.4 Two oppositely charged metal plates are placed parallel to one another separated by a distance of $1.0 \times 10^{-3}$ m. If an electron is released very close to the negative plate it will have a kinetic energy of $6.0 \times 10^{-19}$ joule at the instant it collides with the positive plate. What is the magnitude of the intensity of the uniform electric field between the two plates?

E = ______________ nt/coul

ID# 21-10.4

TO# 053-00

Skill 2 Type____

Diagram? no

Ans: $3.75 \times 10^{3}$

21-10.5 Two oppositely charged metal plates are placed parallel to one another. The uniform electric field between the plates has an intensity of $2.0 \times 10^4$ nt/coul. If an electron is released very close to the negative plate it has a kinetic energy of $3.2 \times 10^{-18}$ joule at the instant it collides with the positive plate. By what distance are the plates separated?

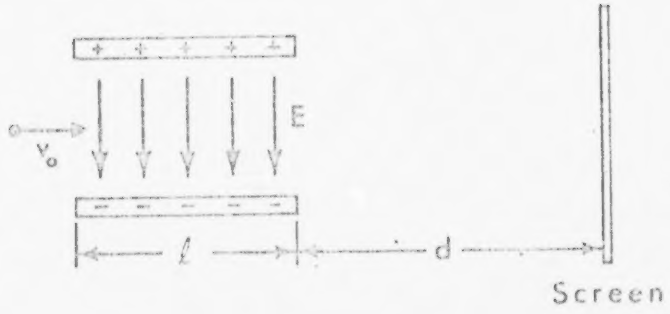
d = ______________ m

ID: 21-10.5
TOP 05.2-00
Skill 2 Type____
Diagram? no
Ans: $1.0 \times 10^{-3}$

USNA Accepts____
Ques. Proofed____
If revised after
student use:
Date:____
New Card used?____
NYIT, Fall 1970

21-14.1 The figure below shows an electron projected with speed $v_o = 2.00 \times 10^7$ m/sec at right angle to a uniform field E. Find the deflection of the beam on the screen when the length $\ell$ of the plate is 2.00 cm, the distance d from the end of the plates to the screen is 19.0 cm, and $E = 1.60 \times 10^4$ nt/coul. (Neglect the gravitational effect.)

y = __(?)__ m



ID: 21-14.1
TOP 061-01
Skill 2 Type____
Diagram? yes
Ans: $2.81 \times 10^{-2}$

USNA Accepts____
Ques. Proofed SN
If revised after
student use:
Date:____
New Card used?____
NYIT, Fall 1970

21-14.2 The figure below shows an electron projected with a speed $v_o = 2.00 \times 10^7$ m/sec at right angle to a uniform field $\vec{E}$. The deflection of the beam on the screen is $5.62 \times 10^{-2}$ m when the length ℓ of the plate is 2.00 cm and $E = 1.60 \times 10^4$ nt/coul. Find the distance d from the end of the plates to the screen. (Neglect the gravitational effect.)

d = ___(?)___ cm.

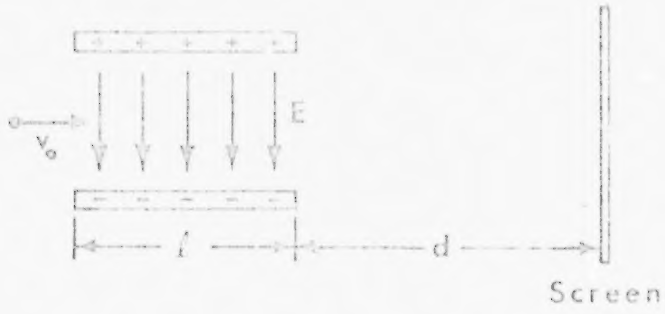
ID# 21.14.2

IO# 061-01

Skill 2 Type____

Diagram? yes

ans: 39.0



SNA Accepts____

ues. Proofed SN

f revised after
student use:

ate:____
ew Card used?____
YIT. Fall 1970

21-14.3 The figure below shows an electron projected with speed $v_o$ at right angle to a uniform field $\vec{E}$. The deflection of the beam on the screen is 5.27 cm when the length ℓ of the plate is 4.00 cm, the distance d from the end of the plates to the screen is 16.0 cm and $E = 1.5 \times 10^4$ nt/coul. Find the speed $v_o$ at which the electron enters the field. (Neglect the gravitational effect.)

$v_o$ = ___(?)___ m/sec

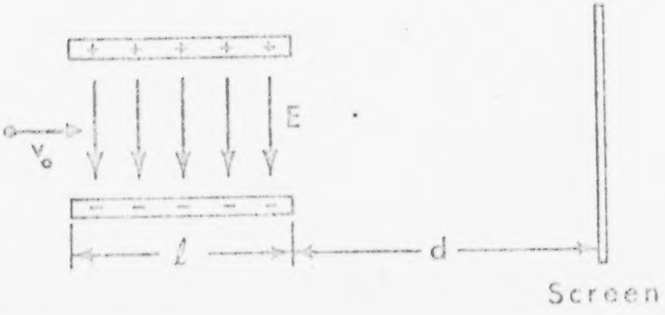
ID# 21-14.3

IO# 061-01

Skill 2 Type____

Diagram? yes

ans: $2.0 \times 10^7$



SNA Accepts____

ues. Proofed SN

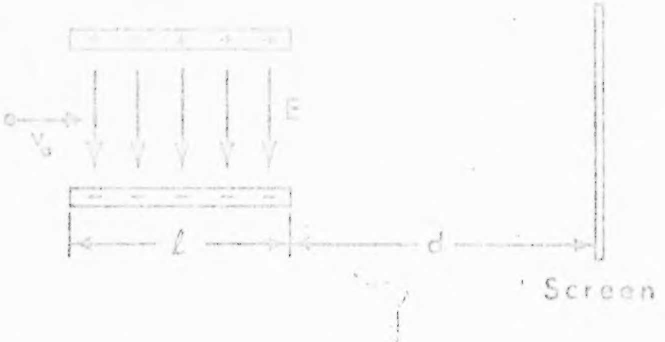
f revised after
student use:

ate:____
ew Card used?____
YIT. Fall 1970

21-14.4 The figure below shows an electron projected with a speed of $v_o = 2.0 \times 10^6$ m/sec at right angle to a uniform field $\vec{E}$. The deflection of the beam on the screen is 15.0 cm when the length ℓ of the plate is 2.00 cm and the distance d from the end of the plates to the screen 14.0 cm. Find the magnitude of the uniform field E.

E = ___(?)___ nt/coul

ID# 21-14.4
TO# 061-01
Skill 2 Type____
Diagram? yes
Ans: $1.14 \times 10^3$



USNA Accepts____
Ques. Proofed____
If revised after student use:
Date:____
New Card used?____
NYIT, Fall 1970

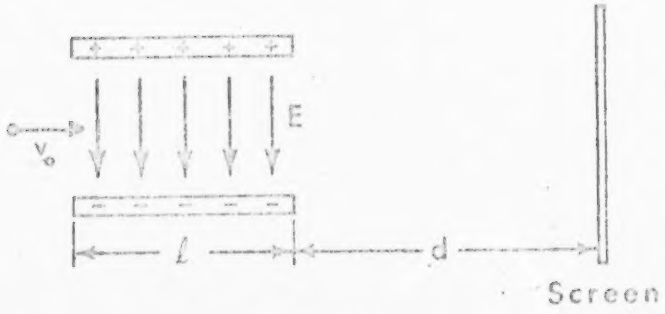
21-14.5 The figure below shows an electron projected with a speed $v_o = 2.0 \times 10^6$ m/sec at right angle to a uniform field $\vec{E}$. The deflection of the beam on the screen is 15.0 cm when the distance from the center of the plates to the screen,

$$d = \frac{\ell}{2}$$

is 20 cm, and $E = 1.14 \times 10^3$ nt/coul. Find the length ℓ of the plate.

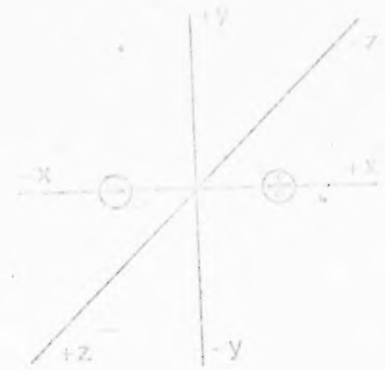
ℓ = ___(?)___ cm

ID# 21-14.5
TO# 061-01
Skill 2 Type____
Diagram? yes
Ans: 1.5



USNA Accepts____
Ques. Proofed____
If revised after student use:
Date:____
New Card used?____
NYIT, Fall 1970

22-1.1



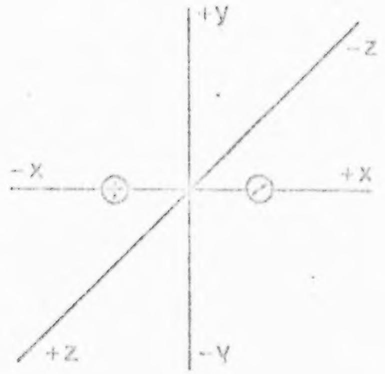
For the dipole configuration shown, the axis of the dipole is defined as

A. the x axis
B. the y axis
C. the z axis
D. any line lying in the plane defined by the x and y axes.

ID# 22-1.1
TO# 056-01
Skill 0 Type
Diagram? yes
Ans: A

USNA Accepts
Ques. Proofed [illegible]
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

22.1.2



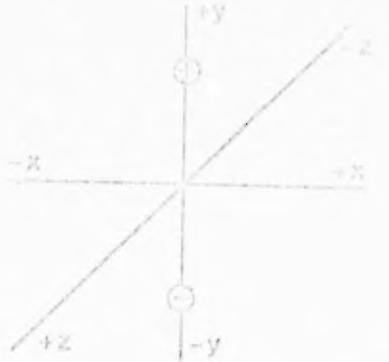
For the dipole configuration shown, the axis of the dipole is defined as

A. the x axis
B. the y axis
C. the z axis
D. any line lying in the plane defined by the x and Z axes.

ID# 22-1.2
TO# 056-01
Skill 0 Type
Diagram? yes
Ans: A

USNA Accepts
Ques. Proofed S/
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

22-1.3



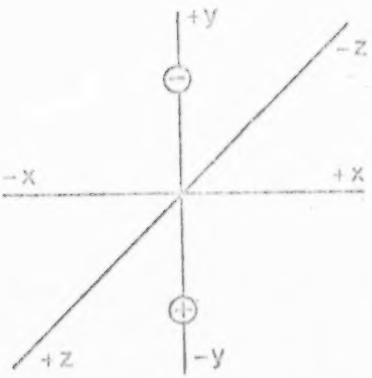
For the dipole configuration shown, the axis of the dipole is defined as

A. the x axis
B. the y axis
C. the z axis
D. any line lying in the plane defined by the y and z axes.

ID# 22-1.3
T.O.# 056-01
Skill 0
Diagram? yes
Answer: B

USNA Accepts ____
Ques. Proofed SV
Ques. Xeroxed____
Diagram Made ____
Diagram OK ____
Diagram Xerox____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record____
NYIT, Fall 1970

22-1.4



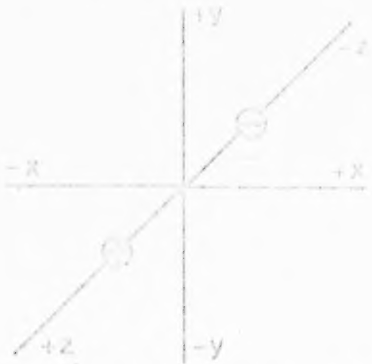
For the dipole configuration shown, the axis of the dipole is defined as

A. the x axis
B. the y axis
C. the z axis
D. any line lying in the plane defined by the x and y axes.

ID# 22-1.4
T.O.# 056-01
Skill 0
Diagram? yes
Answer: B

USNA Accepts ____
Ques. Proofed SV
Ques. Xeroxed____
Diagram Made ____
Diagram OK ____
Diagram Xerox____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record____
NYIT, Fall 1970

22-1.5



For the dipole configuration shown, the axis of the dipole is defined as

A. the x axis
B. the y axis
C. the z axis
D. any line lying in the plane defined by the y and z axes.

ID# 22-1.5
TO# 058-01
Skill 0 Type
Diagram? yes
Ans: C

USNA Accepts
Ques. Proofed SN
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

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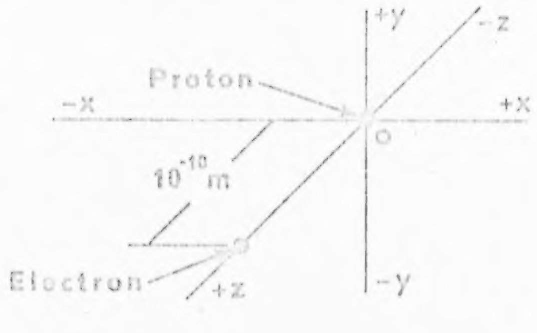
22-4.1



The electric dipole-moment, $\vec{p}$, of the above configuration is, in coul-m.

A. $3.2 \times 10^{-19}$; +z axis

B. $3.2 \times 10^{-19}$, -z axis

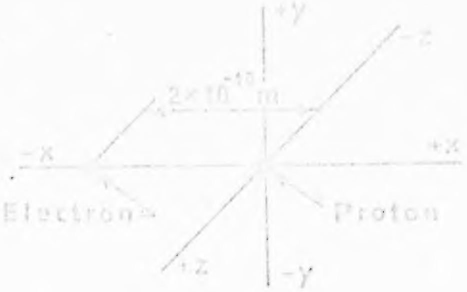
C. $1.6 \times 10^{-19}$; +z axis

D. $1.6 \times 10^{-19}$; -z axis

ID# 22-4.1
TO# 058-05
Skill 2 Type
Diagram? yes
Ans: B

USNA Accepts
Ques. Proofed SN
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

22-4.2



The electric dipole-moment, $\vec{p}$, of the above configuration is, in coul-m.

A. $6.4 \times 10^{-29}$; +x axis

B. $6.4 \times 10^{-29}$; -x axis

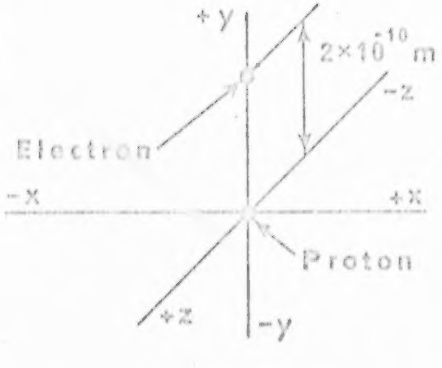
C. $3.2 \times 10^{-29}$; +x axis

D. $3.2 \times 10^{-29}$; -x axis

ID# 22-4.2
TO# 058-05
Skill 2 Type
Diagram? yes
Ans: A

USNA Accepts
Ques. Proofed S
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

22-4.3



The electric dipole-moment, $\vec{p}$, of the above configuration is, in coul-m

A. $6.4 \times 10^{-29}$; +y axis

B. $6.4 \times 10^{-29}$; -y axis

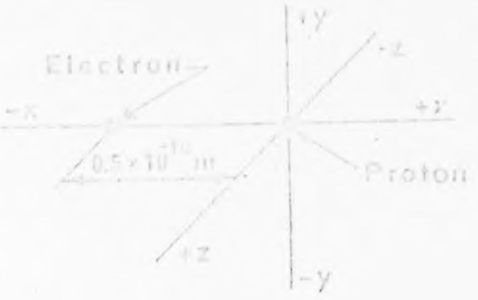
C. $3.2 \times 10^{-29}$; +y axis

D. $3.2 \times 10^{-29}$; -y axis

ID# 22-4.3
TO# 058-05
Skill 2 Type
Diagram? yes
Ans: B

USNA Accepts
Ques. Proofed SN
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

22-4.4


+y
-z
Electron
-x
+x
$0.5 \times 10^{-10}$ m
Proton
+z
-y

ID# 22-4.4
TO# 058-05
Skill 2 Type
Diagram? yes
Ans: C

The electric dipole-moment, $\vec{p}$, of the above configuration is, in coul-m

A. $3.2 \times 10^{-29}$; +x

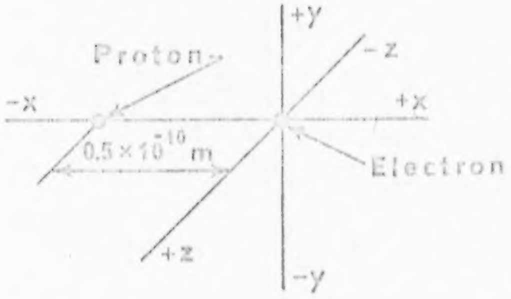
B. $3.2 \times 10^{-29}$; -x

C. $1.6 \times 10^{-29}$; +x

D. $1.6 \times 10^{-29}$; -x

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

22-4.5


+y
-z
Proton
-x
+x
$0.5 \times 10^{-10}$ m
Electron
+z
-y

ID# 22-4.5
TO# 058-05
Skill 2 Type
Diagram? yes
Ans: D

The electric dipole-moment, $\vec{p}$, of the above configuration is, in coul-m

A. $3.2 \times 10^{29}$; +x

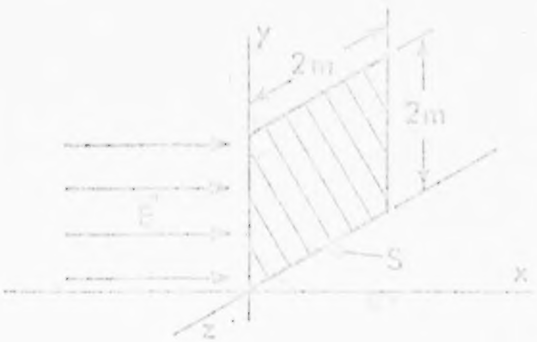
B. $3.2 \times 10^{29}$; -x

C. $1.6 \times 10^{29}$; +x

D. $1.6 \times 10^{29}$; -x

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

22-5.1



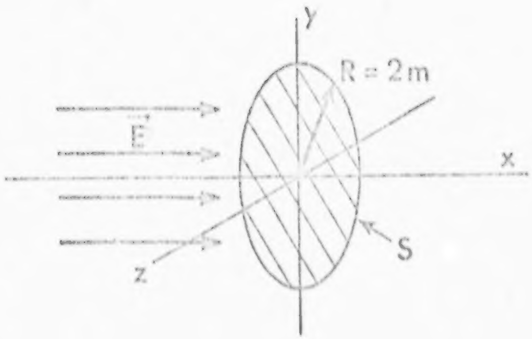
The vector field $\vec{E}$ shown in the diagram has a constant magnitude of 20 nt/coul and is at all points in space parallel to the x-axis. The flux ($\Phi$) of $\vec{E}$ through the surface S shown in the diagram is, in nt-m$^2$/coul

A. zero
B. 20
C. 40
D. 80

ID# 22-5.1
TO# 065-00
Skill 2 Type
Diagram? yes
Ans: D

USNA Accepts
Ques. Proofed SW
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

22-5.2



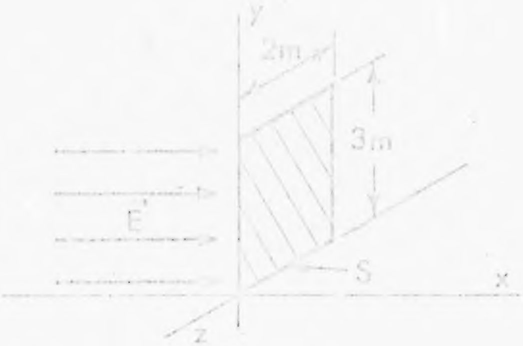
The vector field $\vec{E}$ shown in the diagram has a constant magnitude of 30 nt/coul and is at all points in space parallel to the x-axis. Surface S is a circle of radius 2 m and lying in the y-z plane. The flux ($\Phi$) of $\vec{E}$ through S is, in nt-m$^2$/coul

A. zero
B. $60\pi$
C. $120\pi$
D. $160\pi$

ID# 22-5.2
TO# 065-00
Skill 2 Type
Diagram? yes
Ans: C

USNA Accepts
Ques. Proofed SW
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

22-5.3



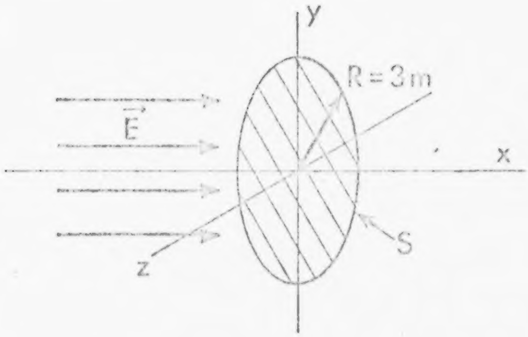
The vector field $\vec{E}$ shown in the diagram has a constant magnitude of 50 nt/coul and is at all points in space parallel to the x-axis. The flux ($\Phi$) of $\vec{E}$ through the surface S shown in the diagram is, in nt-m$^2$/coul

A. 0
B. 100
C. 150
D. 300

ID# 22-5.3
TO# 065-00
Skill 2 Type
Diagram? yes
Ans: D

USNA Accepts
Ques. Proofed SW
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

22-5.4



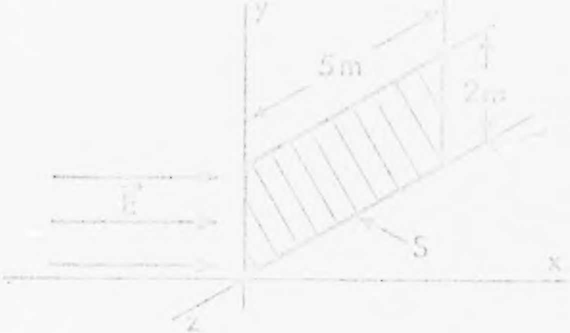
The vector field $\vec{E}$ shown in the diagram has a constant magnitude of 60 nt/coul and is at all points in space parallel to the x-axis. Surface S is a circle of radius 2 m and lying in the y-z plane. The flux ($\Phi$) of $\vec{E}$ through S is, in nt-m$^2$/coul

A. 2160π
B. 540π
C. 180π
D. zero

ID# 22-5.4
TO# 065-00
Skill 2 Type
Diagram? yes
Ans:

USNA Accepts
Ques. Proofed SW
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

22-5.5



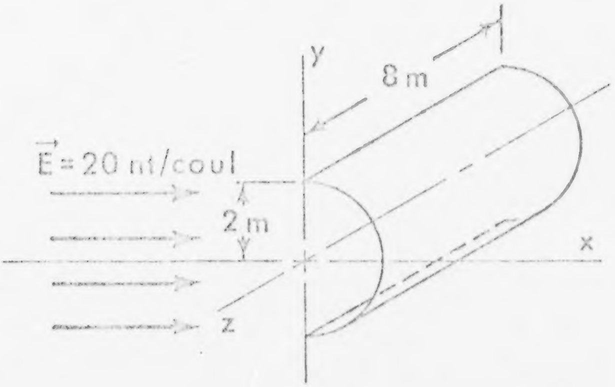
The vector field $\vec{E}$ shown in the diagram has a constant magnitude of 60 nt/coul and is at all points in space parallel to the x-axis. The flux ($\Phi$) of $\vec{E}$ through the surface S shown in the diagram is, in nt-m$^2$/coul

A. zero
B. 120
C. 300
D. 600

ID# 22-5.5
TO# 065-00
Skill 2 Type ___
Diagram? yes
Ans: D

USNA Accepts ___
Ques. Proofed SA
Ques. Xeroxed ___
Diagram Made ___
Diagram OK ___
Diagram Xerox ___
To NYIT ___
To Computer ___
OK Computer ___
Answer Record ___
NYIT, Fall 1970

22-9.1



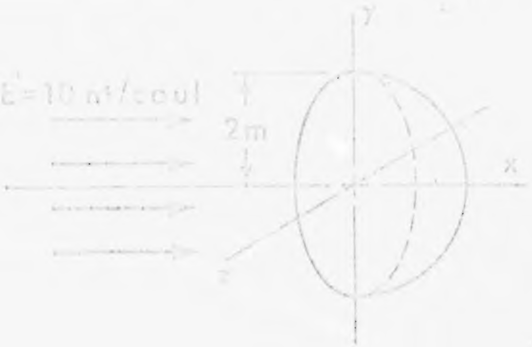
Shown in the figure is a shell which consists only of half a cylinder with no end surfaces. $\vec{E}$ is constant in magnitude and is at all points parallel to the x-axis. The flux ($\Phi_E$) through the cylinder is, in nt-m$^2$/coul

A. zero
B. 320
C. 640
D. 1010

ID# 22-9.1
TO# 065-04
Skill 2 Type ___
Diagram? yes
Ans: C

USNA Accepts ___
Ques. Proofed SA
Ques. Xeroxed ___
Diagram Made ___
Diagram OK ___
Diagram Xerox ___
To NYIT ___
To Computer ___
OK Computer ___
Answer Record ___
NYIT, Fall 1970

22-9.2



ID# 22-9.2

IO# 065-04

Skill 2 Type

Diagram? yes

Ans: C

Shown in the figure is a hollow hemispherical shell (R = 2 m) with no end. $\vec{E}$ is constant in magnitude and is at all points parallel to the x-axis. The flux ($\Phi_E$) through the hemisphere is, in nt-m$^2$/coul

A. 502
B. 251
C. 126
D. 0

USNA Accepts

Ques. Proofed SN
Ques. Xeroxed

Diagram Made
Diagram OK
Diagram Xerox

To NYIT
To Computer
OK Computer

Answer Record

NYIT, Fall 1970

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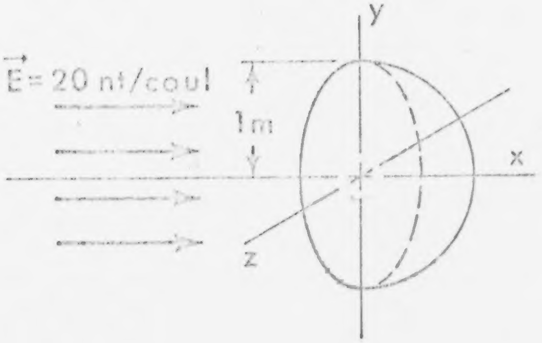
22-9.3



ID# 22-9.3

IO# 065-04

Skill 2 Type

Diagram? yes

Ans: C

Shown in the figure is a hollow hemispherical shell (R = 1 m) with no end. $\vec{E}$ is constant in magnitude and is at all points parallel to the x-axis. The flux ($\Phi_E$) through the hemisphere is, in nt-m$^2$/coul

A. 251
B. 125
C. 63
D. zero

USNA Accepts

Ques. Proofed SN
Ques. Xeroxed

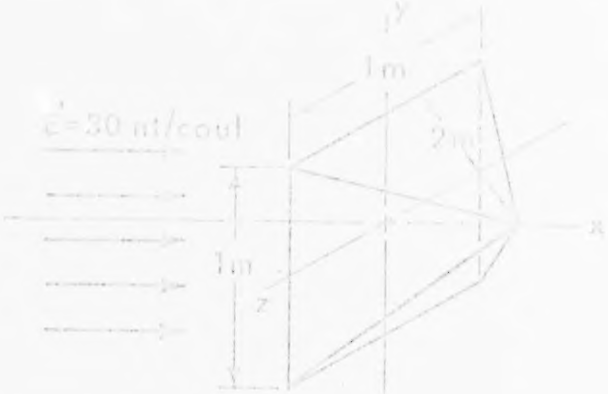
Diagram Made
Diagram OK
Diagram Xerox

To NYIT
To Computer
OK Computer

Answer Record

NYIT, Fall 1970

22-9.4



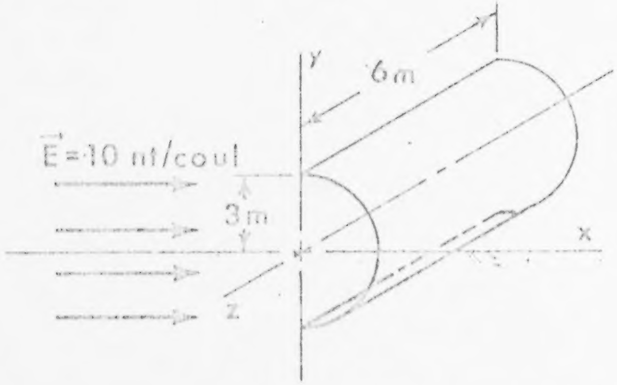
ID# 22-9.4
TO# 065-04
Skill 2 Type
Diagram? yes
Ans: C

Shown in the figure is a hollow shell in the form of a pyramid. $\vec{E}$ is constant in magnitude and is at all points parallel to the x-axis. The flux ($\Phi_E$) through the pyramid is, in nt-m$^2$/coul

A. 120 $\sqrt{3}$
B. 120
C. 30
D. zero

USNA Accepts
Ques. Proofed GA
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

22-9.5



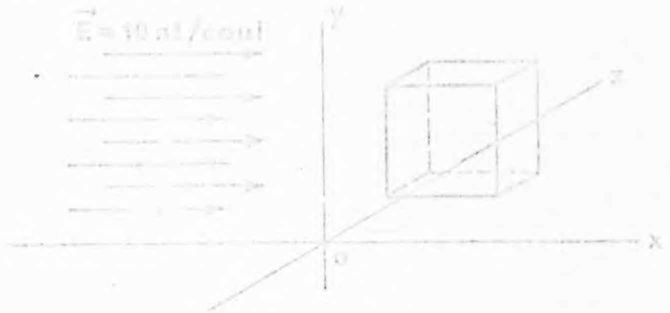
ID# 22-9.5
TO# 065-04
Skill 2 Type
Diagram? yes
Ans: C

Shown in the figure is a shell which consists only of a half a cylinder with no end surfaces. $\vec{E}$ is constant in magnitude and is at all points parallel to the x-axis. The flux ($\Phi_E$) through the cylinder is, in nt-m$^2$/coul

A. 1510
B. 755
C. 360
D. zero

USNA Accepts
Ques. Proofed GA
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

22-14.1



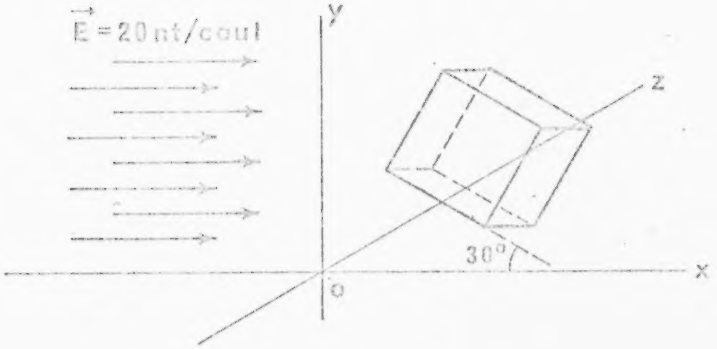
A cubical surface 2 meters on edge is shown in the diagram. $\vec{E}$ is constant in magnitude and is at all points in space parallel to the x-axis. The flux ($\Phi_E$) through the cubical surface is, in nt-m$^2$/coul

A. 240
B. 80
C. 40
D. Zero

ID# 22-14.1
[illegible] 066-00
Skill 1 Type
Diagram? yes
Ans: D

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 19

22-14.2



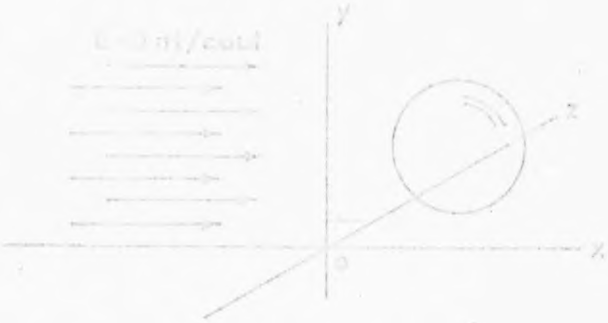
A cubical surface 3 meters on edge is shown in the diagram. The flux ($\Phi_E$) through the cubical surface is, in nt-m$^2$/coul.

A. $90\sqrt{3}$
B. 180
C. $180\sqrt{3}$
D. Zero

ID# 22-14.2
[illegible] 066-00
Skill 1 Ty
Diagram? yes
Ans: D

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 19

22-14.3



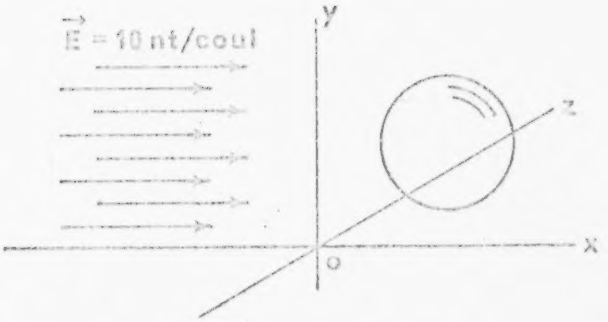
A spherical surface 1 meter in radius is shown in the diagram. The flux ($\Phi_E$) through the spherical surface is, in nt-$m^2$/coul

A. Zero
B. 10π
C. 20/3(π)
D. 20π

ID# 22-14.3
OD# 066-00
Skill 1 Type
Diagram? yes
Ans: A

USNA Accepts
Ques. Proofed 5/8
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 19

22-14.4



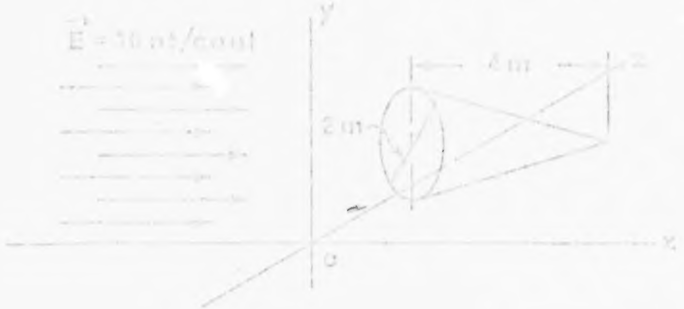
A spherical surface 2 meters in radius is shown in the diagram. The flux ($\Phi_E$) through the spherical surface is, in nt-$m^2$/coul

A. Zero
B. 320/3π
C. 80π
D. 160π

ID# 22-14.4
OD# 066-00
Skill 1 Type
Diagram? yes
Ans: A

USNA Accepts
Ques. Proofed S
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 19

22-14.5



ID# 22-14.5

TO# 011-00

Skill 1 Type

Diagram? yes

Ans: D

USNA Accepts

Ques. Proofed

Ques. Xeroxed

Diagram Made

Diagram OK

Diagram Xerox

To NYIT

To Computer

OK Computer

Answer Record

NYIT, Fall 1970

A closed conical surface is shown in the diagram. The flux ($\Phi_E$) through the surface is, in nt-m$^2$/coul

A. 28π
B. $10\sqrt{3}\,\pi$
C. 10π
D. Zero

23-1.1 A non-conducting uniformly charged sphere ($\rho = +1$ coul/m$^3$) has a radius of 1.5 meters. The sphere is plunged into a very cold solution (temperature = 1° K) and becomes a conductor. The surface charge, σ, of the sphere is, in coul/m$^2$

A. 2.0
B. 1.0
C. 0.5
D. 0.33

ID# 23-1.1

TO# 069-00

Skill 2 Type

Diagram? no

Ans: C

23-1.2 A non-conducting uniformly charged sphere ($\rho = 1.5$ coul/m$^3$) has a radius of 0.5 meters. The sphere is plunged into a very cold solution (temperature = 1° K) and becomes a conductor. The surface charge, σ, of the sphere is, in coul/m$^2$

A. 1.50
B. 0.75
C. 0.50
D. 0.25

ID# 23-1.2

TO# 069-00

Skill 2 Type

Diagram? no

Ans: D

USNA Accepts

23-1.3 A non-conducting uniformly charged sphere ($\rho$ = 1.5 coul/m$^3$) has a radius of 2.5 meters. The sphere is plunged into a very cold solution (temperature = 1° K) and becomes a conductor. The surface charge, $\sigma$, of the sphere is, in coul/m$^2$

A. 3.75
B. 1.50
C. 1.25
D. 0.50

ID# 23-1.3
TO# 069-00
Skill 2 Type
Diagram? no
Ans: C

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK

23-1.4 A non-conducting uniformly charged sphere (Charge Density = $\rho$ coul/m$^3$) has a radius of 2 meters. The sphere is plunged into a very cold solution (temperature = 1° K) and becomes a conductor. The surface charge ($\sigma$) of the sphere is 1.5 coul/m$^2$. The Charge Density ($\rho$) of the non-conducting sphere must have been, in coul/m$^3$

A. 4.50
B. 2.25
C. 1.50
D. 0.75

ID# 23-1.4
TO# 069-00
Skill 2 Type
Diagram? no
Ans: B

USNA Accepts
Ques. Proofed

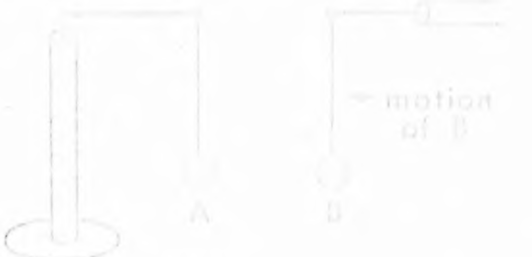
23-1.5 A non-conducting uniformly charged sphere (Charge Density = $\rho$ coul/m$^3$) has a radius of 1.5 meters. The sphere is plunged into a very cold solution (temperature = 1° K) and becomes a conductor. The surface charge ($\sigma$) of the sphere is 1.0 coul/m$^2$. The Charge Density ($\rho$) of the non-conducting sphere must have been, in coul/m$^3$

A. 3.00
B. 2.00
C. 1.00
D. 0.67

ID# 23-1.5
TO# 069-00
Skill 2 Type
Diagram? no
Ans: B

USNA Accepts
Ques. Proofed
Ques. Xeroxed

23-5.1



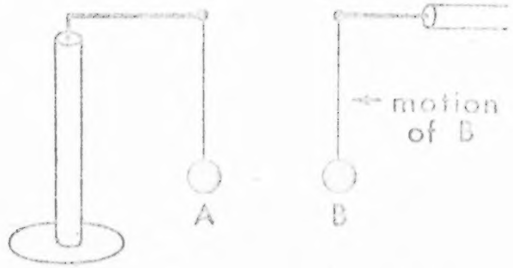
Two pithballs (A and B) are suspended from insulating stands by silk threads as shown. Ball A carries a positive charge while ball B is uncharged. Which of the following best describes the behavior of the balls as ball B is brought into close proximity with ball A?

A. Since B is uncharged, the two balls will experience no electrostatic force.
B. The balls will be initially attracted to each other, touch, and then repel one another.
C. The balls will be attracted to each other, touch, and remain in contact.
D. The balls will experience a force of repulsion to each other.

ID# 23-5.1
TO# 049-00
Skill 2 Type
Diagram? yes
Ans: B

USNA Accepts
Ques. Proofed SN
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

23-5.2



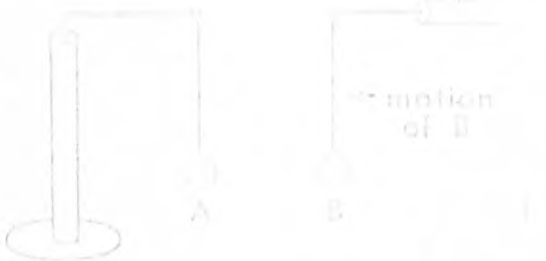
Two pithballs (A and B) carrying positive and negative charges respectively of the same magnitude are suspended from insulating stands by silk threads as shown. Which of the following best describes the behavior of the balls as ball B is brought into close proximity with ball A?

A. The two balls will experience no electrostatic force.
B. The balls will be initally attracted to each other, touch, and then repel one another.
C. The balls will experience a force of repulsion to each other.
D. The balls will be initally attracted to each other, touch, and since they become electrically neutral, remain in contact.

ID# 23-5.2
TO# 049-00
Skill 2 Type
Diagram? yes
Ans: D

USNA Accepts
Ques. Proofed SN
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

23-5.3



Two pithballs (A and B) carrying equal negative charges are suspended from insulating stands by silk threads as shown. Which of the following best describes the behavior of the balls as ball B is brought into close proximity with ball A?

A. The two balls will experience no electrostatic force.
B. The balls will be initally attracted to each other, touch, and then repel one another.
C. The balls will experience a force of repulsion to each other.
D. The balls will be initally attracted to each other, touch, and becoming electrically neutral, remain in contact.

ID# 23-5.3
TO# 049-00
Skill 2 Type
Diagram? yes
Ans: C

USNA Accepts
Ques. Proofed SW
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

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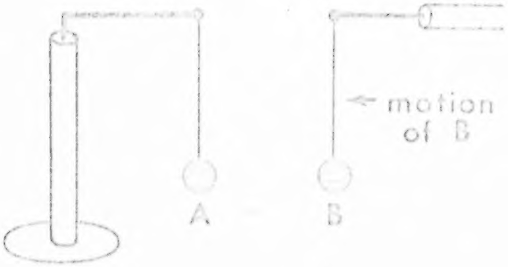
23-5.4



Two pithballs (A and B) carrying equal positive charges are suspended from insulating stands by silk threads as shown. Which of the following best describes the behavior of the balls as ball B is brought into close proximity with ball A?

A. The two balls will experience no electrostatic force.
B. The balls will be initally attracted to each other, touch, and then repel one another.
C. The balls will experience a force of repulsion to each other.
D. The balls will be initally attracted to each other, touch, and becoming electrically neutral, remain in contact.

ID# 23-5.4
TO# 049-00
Skill 2 Type
Diagram? yes
Ans: C

USNA Accepts
Ques. Proofed SW
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

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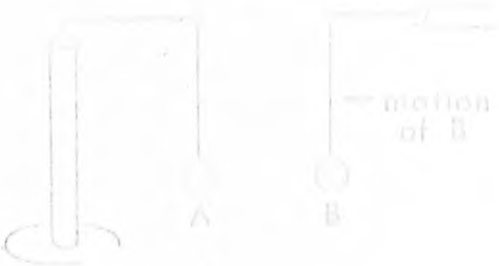


Two pithballs (A and B) each uncharged are suspended from insulating stands by silk threads as shown. Which of the following best describes the behavior of the balls as ball B is brought into close proximity with ball A.

A. The two balls will experience no electrostatic force.
B. The balls will be initally attracted to each other, touch, and then repel one another.
C. The balls will experience a force of repulsion to each other.
D. The balls will be initally attracted to each other, touch, and becoming electrically neut al, remain in contact.

ID# 23-1.5
TO# 062-00
Skill 1 Type
Diagram? yes
Ans: A

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

24-1.1 A particular electric field can be described by the following equation:

$$\vec{E} = (2 - x)\ \hat{i}\ \text{nt/coul}$$

The work done in moving a charge q = +1 coul from x = 1 m to x = 4 m is, in joules

A. +3.0
B. +1.5
C. -1.5
D. -3.0

ID# 24-1.1
TO# 062-00
Skill 2 Type
Diagram? no
Ans: B

24-1.2 A particular electric field can be described by the following equation:

$$\vec{E} = (2x - 3)\ \hat{i}\ \text{nt/coul}$$

The work done in moving a charge q = +2 coul from x = 0 to x = 2 m is, in joules

A. +8
B. +4
C. -4
D. -8

ID# 24-1.2
TO# 062-00
Skill 2 Type
Diagram? no
Ans: B

USNA Accepts
Ques. Proofed
Ques. Xeroxed

24-1.3 A particular electric field can be described by the following equation:

$$\vec{E} = (3\ x^2 - 4)\ \hat{i} \quad \text{nt/coul}$$

The work done in moving a charge q = +1 coul from x = 1 m to x = 2 m is, in joules

A. +9
B. +7
C. -7
D. -9

ID# 24-1.3
TO# 062-00
Skill 2 Type
Diagram? no
Ans: C

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer

24-1.4 A particular electric field can be described by the following equation:

$$\vec{E} = (4\ x^3 - 1)\ \hat{i} \quad \text{nt/coul}$$

The work done in moving a charge q = -1 coul from x = 0 to x = 2 m is, in joules

A. +32
B. +14
C. -14
D. -32

ID# 24-1.4
TO# 062-00
Skill 2 Type
Diagram? no
Ans: B

USNA Accepts
Ques. Proofed ✓

24-1.5 A particular electric field can be described by the following equation:

$$\vec{E} = (4\ x - 2)\ \hat{i} \quad \text{nt/coul}$$

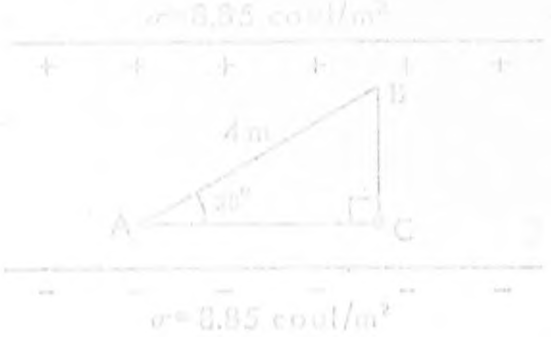
The work done in moving a charge of q = -1 coul from x = 1 m to x = 3 m is, in joules

A. +12
B. +8
C. -8
D. -12

ID# 24-1.5
TO# 062-00
Skill 2 Type
Diagram? no
Ans: A

USNA Accepts

24-6.1



Two parallel plates each with a surface charge density $\sigma$ = 8.85 coul/m² form a region of uniform electric field as shown in the diagram. The potential difference $V_{AB} \equiv V_B - V_A$ is, in volts

A. $1 \times 10^{12}$
B. $2 \times 10^{12}$
C. $4 \times 10^{12}$
D. $8 \times 10^{12}$

ID# 24-6.1
TO# 071-04
Skill 2 Type
Diagram? yes
Ans: B

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

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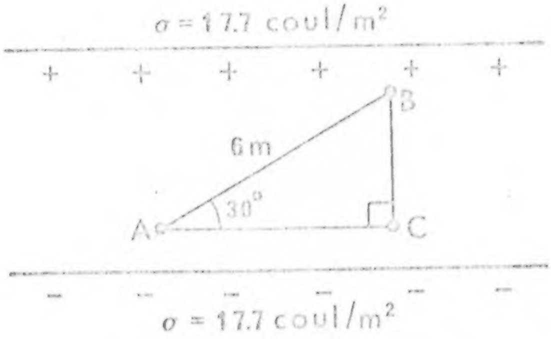
24-6.2



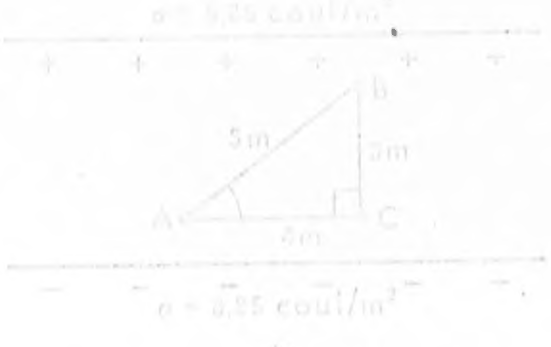
Two parallel plates each with a surface charge density $\sigma$ = 17.7 coul/m² form a region of uniform electric field as shown in the diagram. The potential difference $V_{AB} \equiv V_B - V_A$ is, in volts

A. $3 \times 10^{12}$
B. $3\sqrt{3} \times 10^{12}$
C. $6 \times 10^{12}$
D. $12 \times 10^{12}$

ID# 24-6.2
TO# 071-04
Skill 2 Type
Diagram? yes
Ans: C

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

24-6.3



Two parallel plates each with a surface charge density $\sigma = 8.85$ coul/m$^2$ form a region of uniform electric field as shown in the diagram. The potential difference $V_{AC} \equiv V_C - V_A$ is, in volts

A. $2 \times 10^{12}$

B. $4 \times 10^{12}$

C. $-4 \times 10^{12}$

D. zero

ID# 24-6.3
TO# 071-04
Skill 2 Type
Diagram? yes
Ans: D

USNA Accepts ___
Ques. Proofed ___
Ques. Xeroxed ___
Diagram Made ___
Diagram OK ___
Diagram Xerox ___
To NYIT ___
To Computer ___
OK Computer ___
Answer Record ___
NYIT, Fall 1970

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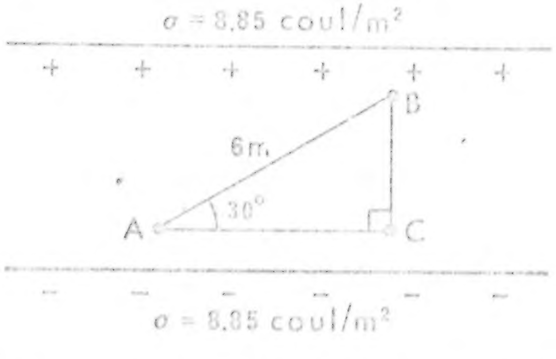
24-6.4



Two parallel plates each with a surface charge density $\sigma = 8.85$ coul/m$^2$ form a region of uniform electric field as shown in the diagram. The potential difference $V_{BA} \equiv V_A - V_B$ is, in volts

A. $+3 \times 10^{12}$

B. $+1.5 \times 10^{12}$

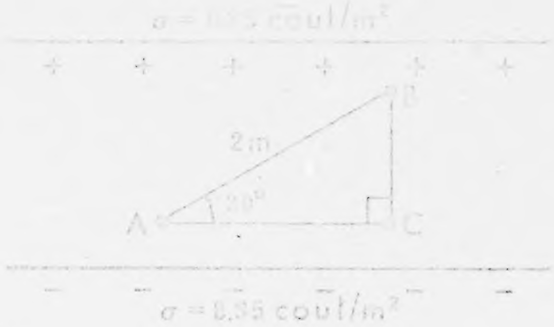
C. $-3 \times 10^{12}$

D. $-6 \times 10^{12}$

ID# 24-6.4
TO# 071-04
Skill 2 Type
Diagram? yes
Ans: C

USNA Accepts ___
Ques. Proofed ___
Ques. Xeroxed ___
Diagram Made ___
Diagram OK ___
Diagram Xerox ___
To NYIT ___
To Computer ___
OK Computer ___
Answer Record ___
NYIT, Fall 1970

[illegible]



Two parallel plates each with a surface charge density $\sigma = 8.85$ coul/m² form a region of uniform electric field as shown in the diagram. The potential difference $V_{AB} = V_B - V_A$ is, in volts

A. $4 \times 10^{12}$

B. $2 \times 10^{12}$

C. $1 \times 10^{12}$

D. $0.5 \times 10^{12}$

ID# [illegible]
TO# 071-[illegible]
Skill 2 Type
Diagram? yes
Ans: C

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____

24-11.1 The potential (V) at a distance of 3 m from an isolated point charge of $q = +2 \times 10^{-6}$ coul is, in volts

A. $-6 \times 10^3$

B. $-2 \times 10^3$

C. $+2 \times 10^3$

D. $+6 \times 10^3$

ID# 24-11.1
T.O.# 072-00
Skill 2
Diagram? no
Answer: D

24-11.2 The potential (V) at a distance of 2 m from an isolated point charge of $q = +4 \times 10^{-6}$ coul is, in volts.

A. $18 \times 10^3$

B. $9 \times 10^3$

C. $-9 \times 10^3$

D. $-18 \times 10^3$

ID# 24-11.2
T.O.# 072-00
Skill 2
Diagram? no
Answer: A

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____

24-11.3 The potential (V) at a distance of 2 m from an isolated point charge of $q = -10^{-6}$ coul is, in volts

A. $+4.5 \times 10^3$

B. $+2.25 \times 10^3$

C. $-2.25 \times 10^3$

D. $-4.5 \times 10^3$

ID# 24-11.3
T.O.# 072-00
Skill 2
Diagram? no
Answer: D

USNA Accepts ____
Ques. Proofed ✓
Ques. Xeroxed ____
Diagram Made ____

24-11.4 The potential (V) at a distance of 2 m from an isolated electron is, in volts

A. $-4.1 \times 10^{-21}$

B. $-2.05 \times 10^{-21}$

C. $-7.2 \times 10^{-10}$

D. $-3.6 \times 10^{-10}$

ID# 24-11.4
T.O.# 072-00
Skill 2
Diagram? no
Answer: C

USNA Accepts ____
Ques. Proofed ✓
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____

24-11.5 The potential (V) at a distance of 3 m from an isolated point charge of $q = +3 \times 10^{-6}$ coul is, in volts.

A. $1 \times 10^3$

B. $3 \times 10^3$

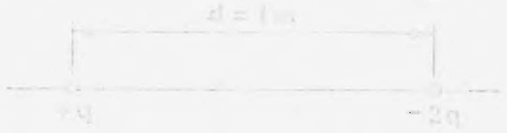
C. $9 \times 10^3$

D. $81 \times 10^3$

ID# 24-11.5
T.O.# 072-00
Skill 2
Diagram? no
Answer: C

USNA Accepts ____
Ques. Proofed ✓
Ques. Xeroxed ____
Diagram Made ____

24-15.1



Two charges of magnitude +q and -2 q are separated by a distance of 1 m. The two points on the line joining the two charges where the potential V = 0 are

A. 1/2 m left of +q; 1 m right of +q.

B. 1 m left of +q; 1/3 m right of +q.

C. one pt 1/3 m right of +q.

D. There are no points where V = 0.

ID# 24-15.1
T.O.# 073-00
Skill 2
Diagram? yes
Answer: B

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USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

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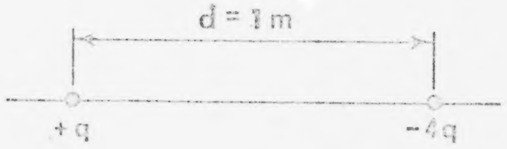
24-15-2



Two charges of magnitude +q and -4 q are separated by a distance of 1 m. The two points on the line joining the two charges where the potential V = 0 are

A. 1/3 m left of +q; 1/5 m right of +q.

B. 1/5 m left of +q; 1/3 m right of +q.

C. one point 1/5 m to right of +q.

D. There are no points where V = 0.

ID# 24-15.2
T.O.# 073-00
Skill 2 Type
Diagram? yes
Ans: A

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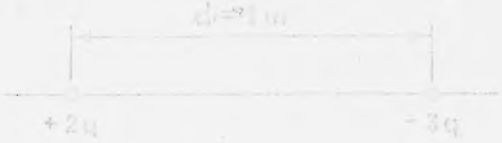
USNA Accepts
Ques. Proofed
If revised after student use:
Date:
New Card used
NYIT Fall 1970

24-15.3



Two charges of magnitude +2 q and -3 q are separated by a distance of 1 m. The two points on the line joining the two charges where the potential V = 0 are

A. 2/5 m left of +2 q; 2 m right of +2 q.

B. 2 m left of + 2 q; 2/5 m right of +2 q.

C. one point 2/5 m right of +2 q.

D. There are no points where V = 0.

ID# 24-15.3
T.O.# 073-00
Skill 2
Diagram? yes
Answer: B

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

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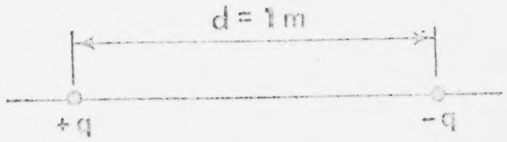
24-15.4



Two charges of magnitude +q and -q are separated by a distance of 1 m. The two points on the line joining the two charges where the potential V = 0 are

A. The position of +q; 1/2 m right of +q.

B. The position of -q; 1/2 m left of -q.

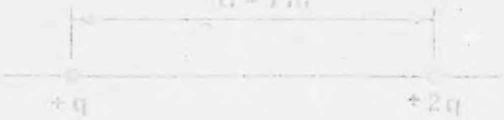
C. one point 1/2 m right of +q.

D. There are no points where V = 0.

ID# 24-15.4
T.O.# 073-00
Skill 2
Diagram? yes
Answer: C

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

24-15.5



Two charges of magnitude +q and +2 q are separated by a distance of 1 m. The two points on the line joining the two charges where the potential V = 0 are

A. 1/3 m left of +q; 1 m right of +q.

B. 1 m left of +q; 1/3 m right of +q.

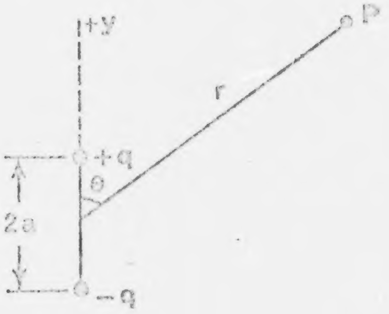
C. one point 1/3 m right of +q.

D. There are no points where V = 0.

ID# 24-15.5
T.O.# 073-00
Skill 2
Diagram? yes
Answer: D

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

25-1.1 At a point P the electrical potential due to a dipole located at the origin of an xy-plane system is given by



$$V = \frac{1}{4\pi\varepsilon_o}\,\frac{P\cos\theta}{r^2}\ .$$

where $p = 2\,aq$ and $r^2 = x^2 + y^2$ and $\theta$ is measured from the + y axis, the y component of the electric field (Ey) at point P is given by

$$E_y = -\,\frac{P}{4\pi\varepsilon_o}\left[\frac{x^2 - 2y^2}{(x^2 + y^2)\ 3/2}\right]$$

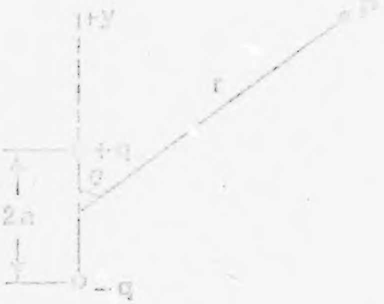
A. This is the CORRECT expression for Ey.

B. This is NOT the correct expression for Ey.

ID# 25-1.1
TO# 073-03
Skill 2 Type ____
Diagram? yes
Ans: B

USNA Accepts ____
Ques. Proofed ____
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____
To Computer ____
OK Computer ____
Answer Record ____
NYIT, Fall 1970

25-1.4 At a point P the electrical potential due to a dipole located at the origin of an xy-plane system is given by



$$V = \frac{1}{4\pi\varepsilon_o}\frac{P\cos\theta}{r^2}$$

where $p = aq$ and $r^2 = x^2 + y^2$ and θ is measured from the +y axis, the y component of the electric field (Ey) at point P is given by

$$Ey = -\frac{P}{4\pi\varepsilon_o}\left[\frac{x}{(x^2+y^2)\ 3/2}\right]$$

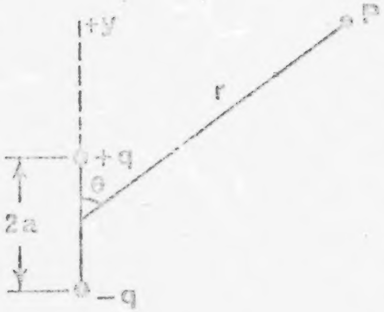
A. This is the CORRECT expression for Ey.

B. This is NOT the correct expression for Ey.

ID# 25-1.4
TO# 073-05
Skill 2 Type
Diagram? yes
Ans: B

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

25-1.5 At a point P the electrical potential due to a dipole located at the origin of an xy-plane system is given by



$$V = \frac{1}{4\pi\varepsilon_o}\frac{P\cos\theta}{r^2}$$

where $p = 2\,aq$ and $r^2 = x^2 + y^2$ and θ is measured from the +y axis, the y component of the electric field (Ey) at point P is given by

$$Ey = -\frac{P}{4\pi\varepsilon_o}\left[\frac{x^2 - y^2}{(x^2+y^2)\ 5/2}\right]$$

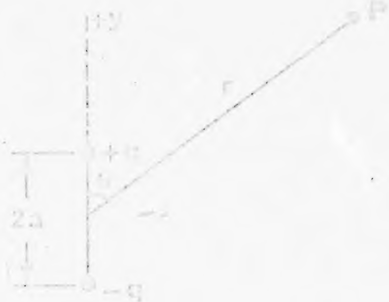
A. This is the CORRECT expression for Ey.

B. This is NOT the correct expression for Ey.

ID# 25-1.5
TO# 073-03
Skill 2 Type
Diagram? yes
Ans: B

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

25-1.2 At a point P the electrical potential due to a dipole located at the origin of an xy-plane system is given by



$$V = \frac{1}{4\pi\varepsilon_o} \frac{P \cos \theta}{r^2}$$

where p = 2 aq and $r^2 = x^2 + y^2$ and θ is measured from the +y axis, the y component of the electric field (Ey) at point P is given by

$$Ey = -\frac{P}{4\pi\varepsilon_o}\left[\frac{x^2 - 2y^2}{(x^2 + y^2)\ 5/2}\right]$$

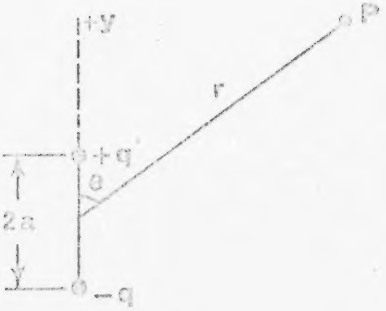
A. This is the CORRECT expression for Ey.

B. This is NOT the correct expression for Ey.

ID# 25-1.2
TO# 073-02
Skill 2 Type
Diagram? Yes
Ans: B

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

25-1.3 At a point P the electrical potential due to a dipole located at the origin of an xy-plane system is given by



$$V = \frac{1}{4\pi\varepsilon_o} \frac{P \cos \theta}{r^2}$$

where p = 2 aq and $r^2 = x^2 + y^2$ and θ is measured from the +y axis, the y component of the electric field (Ey) at point P is given by

$$Ey = -\frac{P}{4\pi\varepsilon_o}\left[\frac{y^2}{(x^2 + y^2)\ 3/2}\right]$$

A. This is the CORRECT expression for Ey.

B. This is NOT the correct expression for Ey.

ID# 25-1.3
TO# 073-03
Skill 2 Type
Diagram? yes
Ans: B

USNA Accepts
Ques. Proofed S
Ques. Xeroxed
Diagram Made
Diagram OK
Diagram Xerox
To NYIT
To Computer
OK Computer
Answer Record
NYIT, Fall 1970

25-6.1 Two concentric, conducting spherical shells have radii of $r = 0.5$ m and $R = 1.0$ m respectively. The respective charges on the shells are $+10^{-6}$ coul and $-10^{-6}$ coul. The difference in potential $(V_r - U_R)$ between the two spheres is, in volts

A. $9 \times 10^3$
B. $+9 \times 10^3$
C. $+36 \times 10^3$
D. Zero

ID# 25-6.1
TO# 074-00
Skill 2 Type
Diagram? no
Ans: B

USNA Accepts
Ques. Proofed SV
Ques. Xeroxed
Diagram Made
Diagram OK

25-6.2 Two concentric, conducting spherical shells have radii of $r = 1/3$ m and $R = 1.0$ m respectively. The respective charges on the shells are $+10^{-6}$ coul and $-10^{-6}$ coul. The difference in potential $(V_r - U_R)$ between the two spheres is, in volts

A. Zero
B. $-18 \times 10^3$
C. $18 \times 10^3$
D. $54 \times 10^3 \rightarrow (54)$

ID# 25-6.2
TO# 074-00
Skill 2 Type
Diagram? no
Ans: C

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made

25-6.3 Two concentric, conducting spherical shells have radii of $r = 1/4$ m and $R = 1$ m respectively. The respective charges on the shells are $+10^{-6}$ coul and $-10^{-6}$ coul. The difference in potential $(V_r - U_R)$ between the two spheres, is, in volts

A. $72 \times 10^3$
B. $27 \times 10^3$
C. $-27 \times 10^3$
D. Zero

ID# 25-6.3
TO# 074-00
Skill 2 Type
Diagram? no
Ans: B

USNA Accepts
Ques. Proofed

25-6.4 Two concentric, conducting spherical shells have radii of $r = 1/2$ m and $R = 1$ m respectively. The respective charges on the shells are $+2 \times 10^{-6}$ coul and $-2 \times 10^{-6}$ coul. The difference in potential $(V_r - U_R)$ between the two spheres is, in volts.

A. $72 \times 10^3$
B. $27 \times 10^3$
C. $-27 \times 10^3$
D. Zero

ID# 25-6.4
TO# 074-00
Skill 2 Type
Diagram? no
Ans: B

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made

25-6.5 Two concentric, conducting spherical shells have radii of $r = 1/3$ m and $R = 1$ m respectively. The respective charges on the shells is $+2 \times 10^{-6}$ coul and $-2 \times 10^{-6}$ coul. The difference in potential $(V_r - U_R)$ between the two spheres is, in volts

A. $108 \times 10^3$
B. $36 \times 10^3$
C. $-36 \times 10^3$
D. Zero

ID# 25-6.5
TO# 074-00
Skill 2 Type
Diagram? no
Ans: B

USNA Accepts
Ques. Proofed CH

25-10.1 The potential at a point a distance r from the center of a *non-conducting* sphere of radius $R_1$ charged uniformly with a total charge Q is proportional to

$$r^2 \text{ for } r < R; \ \frac{1}{r} \text{ for } r > R$$

A. The above expression is correct.

B. The above expression is incorrect.

ID# 25-10.1
TO# 074-00
Skill 2 Type
Diagram? no
Ans: A

USNA Accepts
Ques. Proofed CH
Ques. Xeroxed
Diagram Made

25-10.2 The potential at a point a distance r from the center of a *non-conducting* sphere of radius $R_1$ charged uniformly with a total charge Q is proportional to

$$\frac{1}{r^2} \text{ for both } r < R \text{ and } r > R$$

A. The above expression is correct.

B. The above expression is incorrect.

ID# 25-10.2
T.O.# 074-00
Skill 2
Diagram? no
Answer: B

==============
USNA Accepts ____
Ques. Proofed SN
Ques. Xeroxed ____
Diagram Made ____
Diagram OK ____
Diagram Xerox ____
To NYIT ____

25-10.3 The potential at a point a distance r from the center of a *non-conducting* sphere of radius $R_1$ charged uniformly with a total charge Q is proportional to

$$r \text{ for } r < R;\ \frac{1}{r^2} \text{ for } r > R$$

A. The above expression is correct.

B. The above expression is incorrect.

ID# 25-10.3
T.O.# 074-00
Skill 2
Diagram? no
Answer: B

==============
USNA Accepts ____
Ques. Proofed SN
Ques. Xeroxed ____
Diagram Made

25-10.4 The potential at a point a distance r from the center of a *non-conducting* sphere of radius $R_1$ charged uniformly with a total charge Q is proportional to

$$\text{constant for } r < R;\ \frac{1}{r} \text{ for } r > R$$

A. The above expression is correct.

B. The above expression is incorrect.

ID# 25-10.4
T.O.# 074-00
Skill 2
Diagram? no
Answer: B

==============
USNA Accepts ____
Ques. Proofed SN

25-10.5 The potential at a point a distance r from the center of a non-conducting sphere of radius R, charged uniformly with a total charge q is proportional to

$$\text{Zero for } r < R;\ \frac{1}{r} \text{ for } r > R$$

A. The above expression is correct.

B. The above expression is incorrect.

ID# 25-10.5

T.O.# 076-00

Skill 2

Diagram? no

Answer: B

USNA Accepts

Ques. Proofed GW

Ques. Xeroxed

Diagram Made

Diagram OK

Diagram Xerox

25-14.1 A gold nucleus contains a positive charge equal to that of 79 protons ($q_p = +1.6 \times 10^{-19}$ coul). An α-particle ($Z = 2$) has, at a point a large distance from the nucleus ($r \to \infty$), a kinetic energy of 4 Mev ($1 \text{ ev} = 1.6 \times 10^{-19}$ joules). Assuming that the α-particle is traveling directly toward the stationary gold nucleus, the distance of closest approach of the α-particle to the nucleus is, in meters

A. $9.2 \times 10^{-33}$
B. $7.2 \times 10^{-16}$
C. $5.7 \times 10^{-14}$
D. $11.4 \times 10^{-14}$

ID# 25-14.1

TO# 076-00

Skill 2 Type

Diagram? no

Ans: C

USNA Accepts

Ques. Proofed GW

Ques. Xeroxed

Diagram Made

25-14.2 A gold nucleus contains a positive charge equal to that of 79 protons ($q_p = +1.6 \times 10^{-19}$ coul). An α-particle ($Z = 2$) has, at a point a large distance from the nucleus ($r \to \infty$), a kinetic energy of 5 Mev ($1 \text{ ev} = 1.6 \times 10^{-19}$ joules). Assuming that the α-particle is traveling directly toward the stationary gold nucleus, the distance of closest approach of the α-particle to the nucleus is, in meters

A. $9.12 \times 10^{-14}$
B. $4.56 \times 10^{-14}$
C. $5.8 \times 10^{-16}$
D. $7.3 \times 10^{-33}$

ID# 25-14.2

TO# 076-00

Skill 2 Type

Diagram? no

Ans: B

USNA Accepts

Ques. Proofed GW

25-14.2 A gold nucleus contains a positive charge equal to that of 79 protons ($q_p = +1.6 \times 10^{-19}$ coul). A proton has, at a point a large distance from the nucleus ($r \to \infty$), a kinetic energy of 4 Mev (1 ev = $1.6 \times 10^{-19}$ joules). Assuming that the proton is traveling directly toward the stationary gold nucleus, the distance of closest approach of the proton to the nucleus is, in meters

A. $2.84 \times 10^{-8}$
B. $2.84 \times 10^{-14}$
C. $3.6 \times 10^{-16}$
D. $4.55 \times 10^{-33}$

ID# 25-14.2
TO# 076-00
Skill 2 Type
Diagram? no
Ans: B

USNA Accepts
Ques. Proofed
Ques. Xeroxed
Diagram Made

25-14.4 A gold nucleus contains a positive charge equal to that of 79 protons ($q_p = +1.6 \times 10^{-19}$ coul). An $\alpha$-particle ($Z = 2$) has, at a point a large distance from the nucleus ($r \to \infty$), a kinetic energy of 6 Mev (1 ev = $1.6 \times 10^{-19}$ joules). Assuming that the $\alpha$-particle is traveling directly toward the stationary gold nucleus, the distance of closest approach of the $\alpha$-particle to the nucleus is, in meters.

A. $3.8 \times 10^{-8}$
B. $7.6 \times 10^{-14}$
C. $3.8 \times 10^{-14}$
D. $6.1 \times 10^{-33}$

ID# 25-14.4
TO#
Skill 2 Type
Diagram? no
Ans: C

USNA Accepts
Ques. Proofed
Ques. Xeroxed

26-1.1 A parallel plate capacitor consists of two parallel conducting plates of area $10^{-2}$ m$^2$ and separated by a distance of 1 mm. The capacitance of this capacitor is, in farads

A. $8.85 \times 10^{-9}$
B. $8.85 \times 10^{-11}$
C. $8.85 \times 10^{-14}$
D. $8.85 \times 10^{-17}$

ID# 26-1.1
TO# 078-00
Skill 2 Type
Diagram? no
Ans: B

26-1.2 A parallel plate capacitor consists of two parallel conducting plates of area 60 cm², and separated by a distance of 0.6 mm. The capacitance of this capacitor is, in farads.

A. $8.85 \times 10^{-11}$
B. $8.85 \times 10^{-13}$
C. $8.85 \times 10^{-9}$
D. $8.85 \times 10^{-7}$

ID# 26-1.2
TO# 078-00
Skill 2 Type
Diagram? no
Ans: A

USNA Accepts
Ques. Proofed

26-1.3 A parallel plate capacitor consists of two parallel conducting plates of area 100 cm² and separated by a distance of 0.885 mm. The capacitance of this capacitor is, in farads

A. $7.8 \times 10^{-17}$
B. $10^{-10}$
C. $10^{-9}$
D. $10^{-8}$

ID# 26-1.3
TO# 078-00
Skill 2 Type
Diagram? no
Ans: B

USNA Accepts

26-1.4 A parallel plate capacitor consists of two parallel conducting plates of area 100 cm² and separated by a distance of 1.77 mm. The capacitance of this capacitor is, in farads

A. $5 \times 10^{-7}$
B. $5 \times 10^{-9}$
C. $5 \times 10^{-10}$
D. $5 \times 10^{-11}$

ID# 26-1.4
TO# 078-00
Skill 2 Type
Diagram? no
Ans: D

26-1.5 A parallel plate capacitor consists of two parallel conducting plates of area 80 $cm^2$ and separated by 1.77 mm. The capacitance of this capacitor is, in farads

A. $4 \times 10^{-11}$
B. $4 \times 10^{-10}$
C. $4 \times 10^{-9}$
D. $4 \times 10^{-7}$

ID# 26-1.5
TO# 072-00
Skill 2 Type
Diagram? no
Ans: A

26-6.1 The capacitance of a capacitor formed by two concentric hollow cylinders of length L with radii a and b (b > a) is given by the expression

$$C = 4\pi\varepsilon_0 (b - a)$$

A. The above expression is correct.

B. The above expression is not correct.

ID# 26-6.1
TO# 079-03
Skill 2 Type
Diagram? no
Ans: B

USNA Accepts

26-6.2 The capacitance of a capacitor formed by two concentric hollow cylinders of length L with radii a and b (b > a) is given by the expression

$$C = 2\pi\varepsilon_0 L \ln (b/a)$$

A. The above expression is correct.

B. The above expression is not correct.

ID# 26-6.2
TO# 079-03
Skill 2 Type
Diagram? no
Ans: B

USNA Accepts

26-6.3 The capacitance of a capacitor formed by two concentric hollow cylinders of length L with radii a and b (b > a) is given by the expression

$$C = \frac{2\pi\varepsilon_0 L}{\ln (b/a)}$$

A. The above expression is correct.

B. The above expression is not correct.

ID# 26-6.3
TC# 079-03
Skill 2 Type
Diagram? no
Ans: A

USNA Accepts
Ques. Proofed

26-6.4 The capacitance of a capacitor formed by two concentric hollow cylinders of length L with radii a and b (b > a) is given by the expression

$$C = \frac{\ln (b/a)}{2\pi\varepsilon_0 L}$$

A. The above expression is correct.

B. The above expression is not correct.

ID# 26-6.4
TC# 079-03
Skill 2 Type
Diagram? no
Ans: B

USNA Accepts

26-6.5 The capacitance of a capacitor formed by two concentric hollow cylinders of length L with radii a and b (b > a) is given by the expression

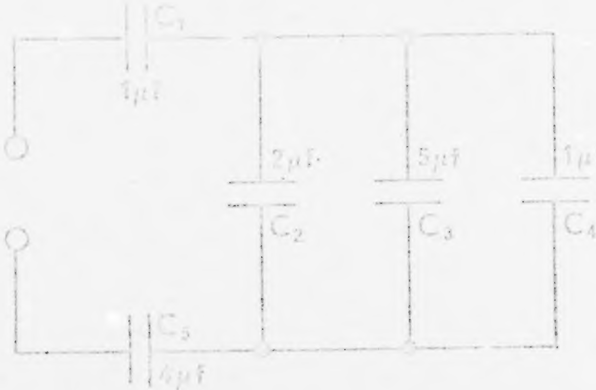
$$C = \frac{4\pi\varepsilon_0 L}{\ln (a/b)}$$

A. The above expression is correct.

B. The above expression is not correct.

ID# 26-6.5
TC# 079-03
Skill 2 Type
Diagram? no
Ans: B

26-10.1


C1
1μf
2μf
5μf
1μf
C2
C3
C4
C5
4μf

The equivalent capacitance of the circuit shown is, in μf.

A. 0.726
B. 1.37
C. 6.25
D. 13.0

ID# 26-10.1
TO# 080-00
Skill 2 Type
Diagram? yes
Ans: A

USNA Accepts
Ques. Proofed
If revised after
student use:

Date:
New Card used?
NYIT, Fall 1970

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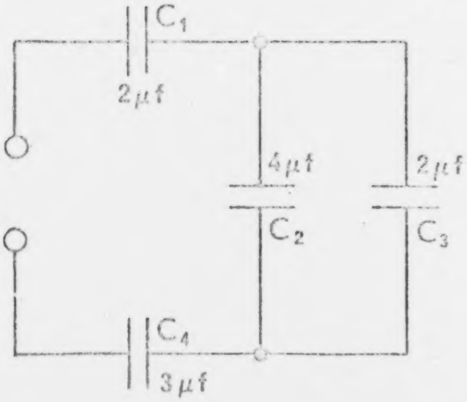
26-10.2


C1
2μf
4μf
2μf
C2
C3
C4
3μf

The equivalent capacitance of the circuit shown is, in μf.

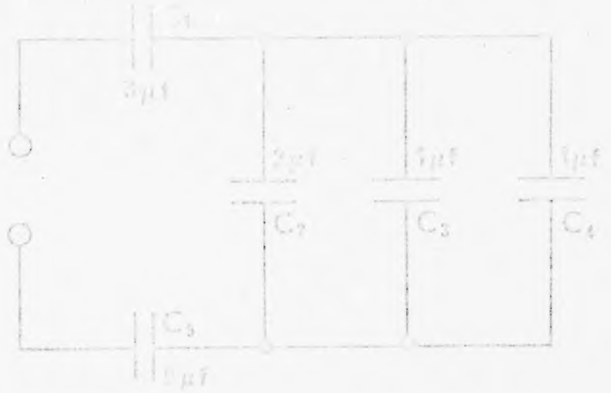
A. 11
B. 6.33
C. 5.75
D. 1

ID# 26-10.2
TO# 080-00
Skill 2 Type
Diagram? yes
Ans: D

USNA Accepts
Ques. Proofed
If revised after
student use:

Date:
New Card used?
NYIT, Fall 1970

26-10.3



C1
3μf
2μf
1μf
1μf
C2
C3
C4
C5
1μf

The equivalent capacitance of the circuit shown is, in μf.

A. 0.75
B. 1.33
C. 9.4
D. 13

ID# 26-10.3
TO# 080-00
Skill 2 Type
Diagram? yes
Ans: B

USNA Accepts
Ques. Proofed ✓
If revised after student use:
Date:
New Card used?
NYIT, Fall 1970

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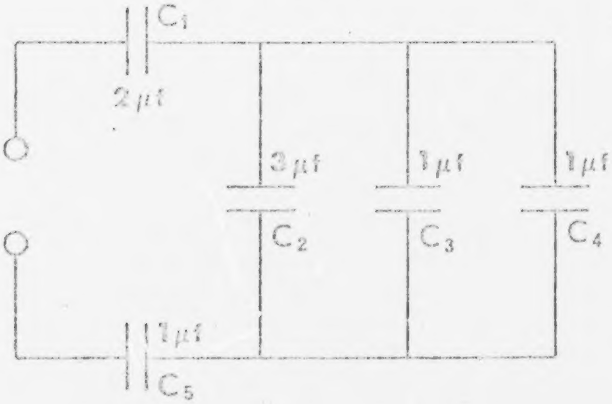
26-10.4



C1
2μf
3μf
1μf
1μf
C2
C3
C4
1μf
C5

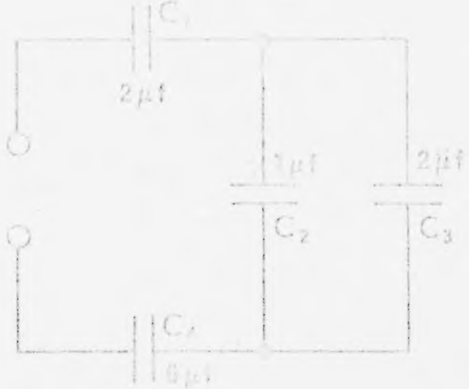
The equivalent capacitance of the circuit shown is, in μf.

A. 8.00
B. 3.43
C. 1.25
D. 0.59

ID# 26-10.4
TO# 080-00
Skill 2 Type
Diagram? yes
Ans: D

USNA Accepts
Ques. Proofed
If revised after student use:
Date:
New Card used?
NYIT, Fall 1970

26-10.5


$C_1$
2μf
1μf
2μf
$C_2$
$C_3$
$C_4$
6μf

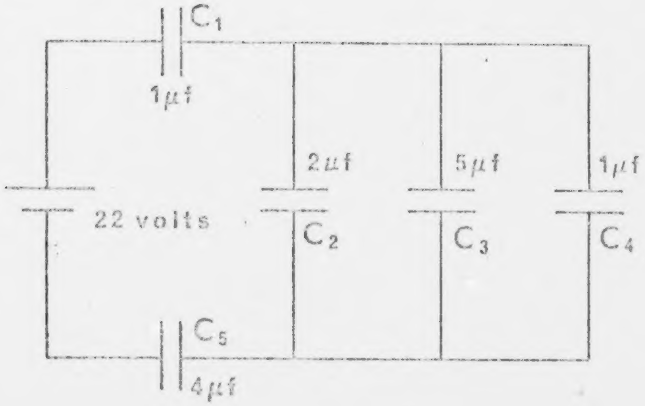
The equivalent capacitance of the circuit shown is, in uf.

A. 11.0
B. 8.67
C. 1.00
D. 0.46

ID# 26-10.5
TO# 032-20
Skill 2 Type
Diagram? yes
Ans: C

USNA Accepts
Ques. Proofed
If revised after student use:
Date:
New Card used?
NYIT, Fall 1970

26-15.1


$C_1$
1μf
2μf
5μf
1μf
22 volts
$C_2$
$C_3$
$C_4$
$C_5$
4μf

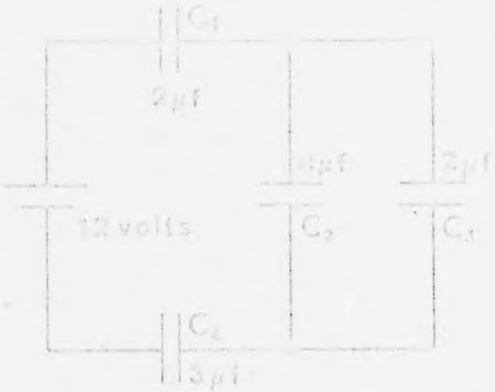
In the circuit shown the total charge supplied by the battery is, in μcoul

A. 286
B. 137
C. 30.3
D. 16

ID# 26-15.1
TO# 032-02
Skill 2 Type
Diagram? yes
Ans: D

USNA Accepts
Ques. Proofed
If revised after student use:
Date:
New Card used?
NYIT, Fall 1970

26-15.2


C1
2µf
4µf
2µf
12 volts
C2
C3
C4
3µf

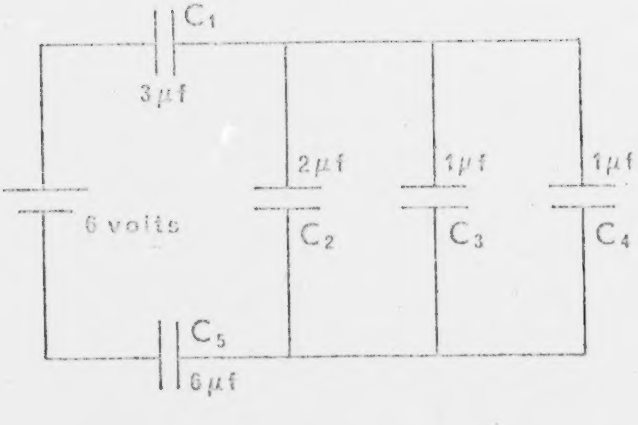
In the circuit shown the total charge supplied by the battery is, in µcoul

A. 12
B. 69
C. 76
D. 132

ID# 26-15.2
IO# 082-02
Skill 2 Type
Diagram? yes
Ans: A

USNA Accepts
Ques. Proofed
If revised after student use:
Date:
New Card used?
NYIT. Fall 1970

26-15.3


C1
3µf
2µf
1µf
1µf
6 volts
C2
C3
C4
C5
6µf

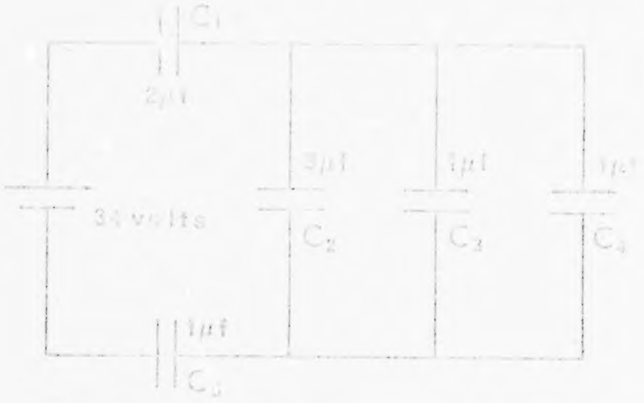
In the circuit shown the total charge supplied by the battery is, in µcoul

A. 78.0
B. 58.4
C. 8.00
D. 4.25

ID# 26-15.3
IO# 082-02
Skill 2 Type
Diagram? yes
Ans: C

USNA Accepts
Ques. Proofed
If revised after student use:
Date:
New Card used?
NYIT. Fall 1970

26-15.4


C1
2μf
3μf
1μf
1μf
34 volts
C2
C3
C4
1μf
C5

In the circuit shown the total charge supplied by the battery is, in μcoul

A. 272
B. 117
C. 42.5
D. 20.0

ID# 26-15.4

LO# 082-02

Skill 2 Type

Diagram? yes

Ans: D

USNA Accepts

Ques. Proofed JW

If revised after student use:

Date:
New Card used?

NYIT. Fall 1970

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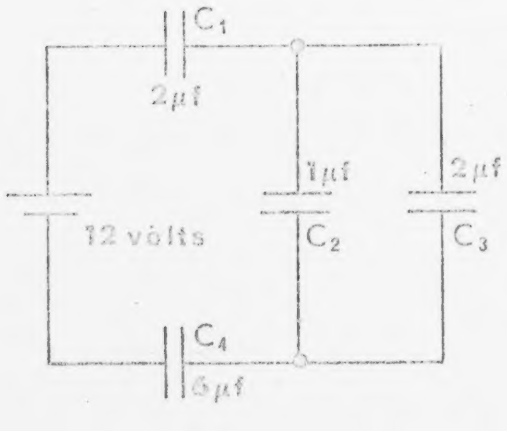
26-15.5


C1
2μf
1μf
2μf
12 volts
C2
C3
C4
6μf

In the circuit shown the total charge supplied by the battery is, in μcoul

A. 132
B. 104
C. 12.0
D. 5.54

ID# 26-15.5

LO# 082-02

Skill 2 Type

Diagram? yes

Ans: C

USNA Accepts

Ques. Proofed

If revised after student use:

Date:
New Card used?

NYIT. Fall 1970

27-1.1 Find the work done in charging a parallel plate capacitor to produce a final charge magnitude $Q = 3 \times 10^{-3}$ coul on each plate and a potential difference between the plates of $V = 400$ volts.

$W =$ (?) joule

ID# 27-1.1
TO# 081-07
Skill 2 Type
Diagram? no
Ans: .60

27-1.2 It requires 1.0 joule of work to charge a parallel plate capacitor to produce a potential difference between the plates of $V - 500$ volts. Find the magnitude of the charge Q on each plate.

$Q =$ (?) coul

ID# 27-1.2
TO# 081-07
Skill 2 Type
Diagram? no
Ans: $4.0 \times 10^{-3}$

27-1.3 It requires 0.75 joule of work to produce a final charge magnitude $Q = 7.5 \times 10^{-3}$ coul on each plate of a parallel plate capacitor. What is the final potential difference V between the plates?

$V =$ (?) volts

ID# 27-1.3
TO# 081-07
Skill 2 Type
Diagram? no
Ans: 200

USNA Accepts
Ques. Proofed SN
If revised after student use:

27-1.4 Find the work done in charging a parallel plate capacitor to produce a final charge magnitude $Q = 5 \times 10^{-3}$ coul on each plate when the capacitance is 12.5 μf.

W = (?) joule

ID# 27-1.4
TO# 081-07
Skill 2 Type
Diagram? no
Ans: 1.0

27-1.5 Find the capacitance of a parallel plate capacitor which requires 4.0 joule of work to produce a final charge magnitude $Q = 2 \times 10^{-3}$ coul on each plate.

C = (?) μf

ID# 27-1.5
TO# 081-07
Skill 2 Type
Diagram? no
Ans: 0.5

27-6.1 Two capacitors, $C_1 = 3.00$ μf and $C_2 = 6.00$ μf, are each charged to a charge magnitude of $1.5 \times 10^{-3}$ coul on each plate. The two capacitors are then connected with like plates together. Find the energy stored in the final system.

E = (?) joule

ID# 27-6.1
TO# 082-00
Skill 2 Type
Diagram? no
Ans: .500

27-6.2 Two capacitors, $C_1 = 4.00$ μf and $C_2 = 12.00$ μf are each charged independently to a potential difference of 50 V between their respective plates. The capacitors are then connected with opposite plates together. Find the energy stored in the final system.

E = (?) joule

ID# 27-6.2
TO# 082-00
Skill 2 Type
Diagram? no
Ans: $5.00 \times 10^{-3}$

27-6.3 Two capacitors $C_1 = 2.00\ \mu f$ and $C_2 = 5.00\ \mu f$ are charged independently to a charge magnitude of $8.00 \times 10^{-4}$ coul and $6.00 \times 10^{-4}$ coul respectively. $C_1$ and $C_2$ are then connected with like plates together. Find the final potential difference between the two plates of $C_1$.

$V_1$ = ___(?)___ volts

ID# 27-6.3
TO# 082-00
Skill 2 Type____
Diagram? no
Ans: 200

27-6.4 Two capacitors $C_1 = 2.00\ \mu f$ and $C_2 = 5.00\ \mu f$ are charged independently to a charge magnitude of $8.20 \times 10^{-4}$ coul and $6.10 \times 10^{-4}$ coul, respectively. $C_1$ and $C_2$ are then connected with opposite plates together. Find the final potential difference between the two plates of $C_1$.

$V_1$ = ___(?)___ volts

ID# 27-6.4
TO# 082-00
Skill 2 Type____
Diagram? no
Ans: 30.0

USNA Accepts____

27-6.5 Two capacitors $C_1 = 2.00\ \mu f$ and $C_2 = 5.00\ \mu f$ are charged to a potential difference between their plates of 50 volts and 120 volts respectively. $C_1$ and $C_2$ are then connected with like plates together. Find the energy stored in the final system.

E = ___(?)___ joule

ID# 27-6.5
TO# 082-00
Skill 2 Type____
Diagram? no
Ans: $3.50 \times 10^{-2}$

USNA Accepts____
Ques. Proofed SN

27-10.1 A dielectric slab of thickness 1.0 mm and a dielectric constant of 4.0 is inserted between the plates of a parallel-plate capacitor with a plate separation of 1.5 mm and a plate area of 2.0 $cm^2$. The capacitance of the capacitor is

A. .885 μμf

B. 2.36 μμf

C. 3.54 μμf

D. 4.71 μμf

ID# 27-10.1
TO# 083-00
Skill 2 Type
Diagram? no
Ans: B

USNA Accepts

27-10.2 A dielectric slab of thickness d/2 and dielectric constant κ is inserted between the plates of a parallel-plate capacitor of plate separation d and area A. What is the capacitance of the capacitor?

A. $C = \frac{2\,\varepsilon_0 A}{d}$

B. $C = \frac{\kappa\varepsilon_0 A}{d}$

C. $C = \frac{2\,\varepsilon_0 A}{\kappa d}$

D. $C = \frac{2\,\kappa\varepsilon_0 A}{d\,(\kappa - 1)}$

ID# 27-10.2
TO# 083-00
Skill 2 Type
Diagram? no
Ans: D

27-10.3 A parallel plate capacitor is made up of two plates with an area of 4.0 $cm^2$ and a dielectric with constant $\kappa = 3.0$ filling the space between the plates. What must be the thickness of the dielectric if the capacitance of the capacitor is 1.77 μμf?

A. 6.0 mm

B. 2.0 mm

C. 1.5 mm

D. 0.6 mm

E. 0.2 mm

ID# 27-10.3
TO# 083-00
Skill 2 Type
Diagram? no
Ans: A

USNA Accepts

(there is no page t 214)

27-10.4 A dielectric slab of thickness b and dielectric constant κ is inserted between the plates of a parallel-plate capacitor of plate separation 3 b and area A. What is the capacitance of the capacitor?

A. $C = \frac{\varepsilon_0 A}{2\,b}$

B. $C = \frac{\kappa\varepsilon_0 A}{b(2\,\kappa + 1)}$

C. $C = \frac{\kappa\varepsilon_0 A}{3\,b}$

D. $C = \frac{\varepsilon_0 A}{2\,\kappa b}$

ID# 27-10.4

TO# 083-00

Skill 2 Type

Diagram? no

Ans: B

USNA Accepts

Ques. Proofed SN

If revised after student use:

27-10.5 A dielectric slab of thickness b = 1.0 mm and dielectric constant κ = 5.0 is inserted between the plates of a parallel plate capacitor of plate separation d = 3.0 mm and area A = 25.0 cm$^2$. What is the capacitance of the capacitor?

A. 5.55 μμf

B. 11.1 μμf

C. 9.94 μμf

D. 22.2 μμf

ID# 27-10.5

TO# 083-00

Skill 2 Type

Diagram? no

Ans: C

27-16.1 A parallel plate air capacitor having capacitance 2.0 μf is connected to a 100 volt battery. After the capacitor is fully charged it is disconnected from the battery and filled with a dielectric material of dielectric constant κ = 2.0. What is the potential difference between the plates of the capacitor now?

v = ________ volts

ID# 27-16.1

TO# 083-00

Skill 2 Type

Diagram? no

Ans: 50

27-16.2 A parallel plate capacitor filled with dielectric material of dielectric constant $\kappa = 2.5$ has a capacitance of 5.0 μf and is connected to a 50 volt battery. After the capacitor is fully charged it is disconnected from the battery and the dielectric material is removed. What is the potential difference between the plates of the capacitor now?

v = ________ volts

ID# 27-16.2
TO# 083-00
Skill 2 Type____
Diagram? no
Ans: 125

USNA Accepts______

27-16.3 A parallel plate air capacitor having capacitance 2.0 μf is connected to a 100 volt battery. After the capacitor is fully charged it is disconnected from the battery and filled with a dielectric material of dielectric constant $\kappa = 2.0$. What is the final energy stored in the capacitor?

E = ________ joule

ID# 27-16.3
TO# 083-00
Skill 2 Type____
Diagram? no
Ans: $10^{-4}$

27-16.4 A parallel plate capacitor filled with a dielectric material of dielectric constant $\kappa = 2.5$ has a capacitance of 5.0 μf and is connected to a 50 volt battery. After the capacitor is fully charged it is disconnected from the battery and the dielectric material is removed. What is the final energy stored in the capacitor?

E = ____________ joule

ID# 27-16.4
TO# 083-00
Skill 2 Type____
Diagram? no
Ans: $1.25 \times 10^{-4}$

USNA Accepts______
Ques. Proofed SN

27-16.5 How much of the stored energy in an air capacitor which has been charged with a 100 volt battery and has a capacitance of 2.0 μf is lost when the capacitor is completely filled with a dielectric material which has a dielectric constant of 2.5?

$E_{lost}$ = __________ joule

ID# 27-16.5

TO# 083-00

Skill 2 Type____

Diagram? no

Ans: $6.0 \times 10^{-3}$

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28-1.1 A continuous current will be present in a metallic conductor if

- A. the resistivity of the conductor exceeds a certain minimum value.
- B. a potential gradient is maintained throughout the length of the conductor.
- C. the conductor has sufficient "free" electrons.
- D. a sufficiently large net positive charge resides on its surface.

ID# 28-1.1

TO# 084-00

Skill 0 Type____

Diagram? no

Ans: B

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USNA Accepts ____

Ques. Proofed SN

Ques. Xeroxed____

Diagram Made____

Diagram OK ____

Diagram Xerox ____

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28-1.2 A continuous current will be present in a metallic conductor if

- A. the conductor has sufficient "free" electrons
- B. the conductor is grounded.
- C. an object bearing an excess positive charge is brought near the conductor.
- D. a potential gradient is maintained throughout the length of the conductor.

ID# 28-1.2

TO# 084-00

Skill 0 Type____

Diagram? no

Ans: D

================

USNA Accepts ____

Ques. Proofed SN

Ques. Xeroxed

28-1.3 A continuous current will be present in a metallic conductor if

A. the net motion of charges is sufficiently large.

B. there are present more "free" electrons than "bound" electrons.

C. a potential gradient is maintained throughout the length of the conductor.

D. the conductor is grounded.

ID# 28-1.3
TO# 084-00
Skill 0 Type
Diagram? no
Ans: C

USNA Accepts
Ques. Proofed S1
Ques. Xeroxed
Diagram Made
Diagram OK

28-1.4 A continuous current will be present in a metallic conductor if

A. the resistance of the conductor remains constant.

B. an object bearing an excess negative charge is brought near the conductor.

C. the conductor is grounded.

D. a potential gradient is maintained throughout the length of the conductor.

ID# 28-1.4
TO# 084-00
Skill 0 Type
Diagram? no
Ans: D

USNA Accepts
Ques. Proofed S1
Ques. Xeroxed

28-1.5 A continuous current will be present in a metallic conductor if

A. the induced surface charge on the conductor is sufficiently large.

B. a potential gradient is maintained throughout the length of the conductor.

C. an object bearing an excess positive charge is brought near the conductor.

D. an object bearing an excess negative charge is brought near the conductor.

ID# 28-1.5
TO# 084-00
Skill 0 Type
Diagram? no
Ans: B

USNA Accepts
Ques. Proofed S1

28-6.1 Current enters a cylindrical wire of radius 3mm, the current density being 80 amp/m$^2$. The wire eventually tapers down to a radius of 1 mm. The current density in the thinner portion of the wire is, in amp/m$^2$.

A. 8.9
B. 26.7
C. 240
D. 720

ID# 28-6.1
TO# 084-10
Skill 2 Type
Diagram? no
Ans: D

28-6.2 Current enters a cylindrical wire of radius 4 mm, the current density being 75 amp/m$^2$. The wire eventually tapers down to a radius of 1 mm. The current density in the thinner portion of the wire is, in amp/m$^2$.

A. 1200
B. 300
C. 18.75
D. 4.70

ID# 28-6.2
TO# 084-10
Skill 2 Type
Diagram? no
Ans: A

USNA

28-6.3 Current enters a cylindrical wire of radius 4 mm, the current density being 60 amp/m$^2$. The cross-sectional area of the wire changes and the current density becomes 960 amp/m$^2$. The radius corresponding to this (960 amp/m$^2$) current density, is in mm.

A. 1/16
B. 1/4
C. 1
D. 16

ID# 28-6.3
TO# 084-10
Skill 2 Type
Diagram? no
Ans: C

USNA

28-6.4 Current enters a cylindrical wire of radius 3 mm, the current density being 90 amp/m$^2$. The cross-sectional area of the wire changes and the current density becomes 810 amp/m$^2$. The radius corresponding to this (810 amp/m$^2$) current density is, in mm.

A. 1/3
B. 1
C. 10
D. 30

ID# 28-6.4
TO# 084-10
Skill 2 Type
Diagram? no
Ans: B

28-6.5 Current enters a cylindrical wire of radius 1 mm, the current density being 720 amp/m$^2$. The cross-sectional area of the wire changes and the current density becomes 80 amp/m$^2$. The radius corresponding to this (80 amp/m$^2$) current density is, in mm.

A. 1/9
B. 1/3
C. 3
D. 9

ID# 28-6.5
TO# 084-10
Skill 2 Type
Diagram? no
Ans: C

28-10.1 A wire with a resistance of 10.0 ohms is drawn out so that its new length is two times its original length. Assuming that the resistivity and the density of the material are not changed during the drawing process the new resistance of the wire is, in ohms.

A. 2.5
B. 5.0
C. 20.0
D. 40.0

ID# 28-10.1
TO# 085-00
Skill 2 Type
Diagram? no
Ans: D

28-10.2 A wire with a resistance of 12.0 ohms is drawn out so that its new length is three times its original length. Assuming that the resistivity and the density of the material are not changed during the drawing process the new resistance of the wire is, in ohms

A. 108
B. 36
C. 4
D. 0.75

ID# 28-10.2
TO# 085-00
Skill 2 Type
Diagram? no
Ans: A

28-10.3 A wire with a resistance of 10.0 ohms is drawn out until its resistance becomes 40.0 ohms. Assuming that the resistivity and the density of the material are not changed during the drawing process the new length is, in terms of the original length (Lo)

A. $\sqrt{2}$ Lo

B. 2 Lo

C. $2\sqrt{2}$ Lo

D. 4 Lo

ID# 28-10.3
TO# 085-00
Skill 2 Type
Diagram? no
Ans: B

28-10.4 A wire with a resistance of 8.0 ohms is drawn out until its resistance becomes 72.0 ohms. Assuming that the resistivity and the density of the material are not changed during the drawing process the new length is, in terms of the original length (Lo)

A. 9 Lo

B. $3\sqrt{3}$ Lo

C. 3 Lo

D. $\sqrt{3}$ Lo

ID# 28-10.4

TO# 085-00

Skill 2 Type___

Diagram? no

Ans: C

USNA Accepts ___

Ques. Proofed ✓

Ques. Xeroxed___

Diagram Made___

Diagram OK ___

28-10.5 A wire with a resistance of 8.0 ohms is drawn out until its resistance becomes 32.0 ohms. Assuming that the resistivity and the density of the material are not changed during the drawing process the new length is, in terms of the original length (Lo)

A. 4 Lo

B. $2\sqrt{2}$ Lo

C. 2 Lo

D. $\sqrt{2}$ Lo

ID# 28-10.5

TO# 085-00

Skill 2 Type___

Diagram? no

Ans: C

USNA Accepts ___

28-15.1 A current of 3 amp exists in a wire 2 m long and 1 mm in diameter, when a 15 volt battery is connected across it. The current through a wire 4 m long and 0.5 mm in diameter, made up of exactly the same material (same $\rho$), if a 20 volt battery is connected across it will be, in amp

A. 8.0
B. 4.0
C. 1.0
D. 0.5

ID# 28-15.1

TO# 085-00

Skill 2 Type___

Diagram? no

Ans: D

USNA Accepts ___

Ques. Proofed ✓

Ques. Xeroxed___

Diagram Made___

Diagram OK

28-15.2 A current of 2 amp exists in a wire 1 m long and 1 mm in diameter, when an 8 volt battery is connected across it. The current through a wire 3 m long and 2 mm in diameter, made up of exactly the same material (same ρ), if a 12 volt battery is connected across it will be, in amp

A. 4.50
B. 4.00
C. 2.25
D. 2.00

ID# 28-15.2
TO# 085-00
Skill 2 Type
Diagram? no
Ans: B

28-15.3 A current of 4 amp exists in a wire 2 m long and 2 mm in diameter, when a 20 volt battery is connected across it. The current through a wire 4 m long and 1 mm in diameter, made up of exactly the same material (same ρ), if a 10 volt battery is connected across it will be, in amp

A. 4.00
B. 2.00
C. 0.50
D. 0.25

ID# 28-15.3
TO# 085-00
Skill 2 Type
Diagram? no
Ans: A

28-15.4 A current of 2 amp exists in a wire 1 m long and 2 mm in diameter, when a 12 volt battery is connected across it. The current through a wire 2 m long and 4 mm in diameter, made up of exactly the same material (same ρ), if a 6 volt battery is connected across it will be, in amp

A. 0.25
B. 0.50
C. 1.00
D. 2.00

ID# 28-15.4
TO# 085-00
Skill 2 Type
Diagram? no
Ans: D

USNA Accepts

28-15.5 A current of 1 amp exists in a wire 2 m long and 2 mm in diameter when an 8 volt battery is connected across it. The current through a wire 4 m long and 1 mm in diameter, made up of exactly the same material (same ρ), if a 32 volt battery is connected across it will be, in amp

A. 8
B. 4
C. 2
D. 0.5

ID# 28-15.5
TO# 085-00
Skill 2 Type
Diagram? no
Ans: D

29-1.1 A current i = 5 amp flows through a circuit containing a resistor, R = 20 ohm. What is the rate at which heat is developed in the resistor?

dH/dt = ________ watt

ID# 29-1.1
TO# 088-00
Skill 1 Type____
Diagram? no
Ans: 500

29-1.2 Heat is developed in a resistor, R = 5.0 ohm, at the rate of 125 joule/sec. What current flowing through the resistor will cause this joule heating?

i = ________ amp

ID# 29-1.2
TO# 088-00
Skill 1 Type____
Diagram? no
Ans: 5.0

29-1.3 A potential difference, v = 100 volt, exist across a resistor R = 500 ohm. What is the rate at which heat is developed in the resistor?

dH/dt = ____________ watt

ID# 29-1.3
TO# 088-00
Skill 1 Type____
Diagram? no
Ans: 20

29-1.4 Heat is developed in a resistor at the rate of 50.0 joule/se When a current of 2.0 amp flows through the resistor. What is the valve of the resistor?

R = ________ ohm

ID# 29-1.4
TO# 088-00
Skill 1 Type____
Diagram? no
Ans: 12.5

29-1.5 A potential difference v = 20 volt exist across a resistor R = 50 ohm through which a current i = 0.4 amp flows. What is the joule heating in the resistor?

P = _______ watt

ID# 29-1.5
TO# 088-00
Skill 1 Type____
Diagram? no
Ans: 8.0

29-5.1 A current of 5.0 amp flowing through a resistor R develops a power of 100 watt. How much power does a current of 10.0 amp develop when flowing through the same resistor?

P = ________ watt

ID# 29-5.1
TO# 089-00
Skill 2 Type____
Diagram? no
Ans: 400

==================
USNA Accepts

29-5.2 A current flowing through a resistor R = 10 ohm develops a power of 25 watt. How much power will the same current flowing through a resistance R = 25 ohm develop?

P = ___________ watt

ID# 29-5.2
TO# 089-00
Skill 2 Type____
Diagram? no
Ans: 62.5

29-5.3 When the magnitude of the potential difference across a resistor is equal to the magnitude of the current flowing through the resistor, the power dissipated by the resistor is 100 watts. What is the resistance?

R = _________ ohm

ID# 29-5.3
TO# 089-00
Skill 2 Type____
Diagram? no
Ans: 1.0

29-5.4 A resistor used as an electric heater dissipates 300 joule/sec when connected to a 120 volt supply. What will be the percentage drop in heat output if the supply voltage drops to 100 volts?

________ %

ID# 29-5.4
TO# 089-00
Skill 2 Type
Diagram? no
Ans: 30.5

29-5.5 A resistor dissipates 100 watts when connected to a 100 volt supply. If this voltage increases to 120 volts what will be the percentage increase in heat output?

________ %

ID# 29-5.5
TO# 089-00
Skill 2 Type
Diagram? no
Ans: 44

29-9.1 Electromotive force, emf, is defined as E = -qdw where dw is the work done by the source of emf on a charge dq, in moving this charge from a lower to a higher potential.

☐ True ☐ False

ID# 29-9.1
TO# 087-00
Skill 0 Type
Diagram? no
Ans: False

29-9.2 Electromotive force, emf, is defined as E = dw/dq where dw is the work done by the source of emf on a charge dq, in moving this charge from a lower to a higher potential.

☐ True ☐ False

ID# 29-9.2
TO# 087-00
Skill 0 Type
Diagram? no
Ans: True

29-9.3 Electromotive force, emf, is defined as $E = -dw/dq$ where dw is the work done by the source of emf on a charge dq, in moving this charge from a lower to a higher potential.

☐ True ☐ False

ID# 29-9.3
TO# 087-00
Skill 0 Type
Diagram? no
Ans: False

29-9.4 Electromotive force, emf, is defined as $E = dq/dw$ where dw is the work done by the source of emf on a charge dq, in moving this charge from a lower to a higher potential.

☐ True ☐ False

ID# 29-9.4
TO# 087-00
Skill 0 Type
Diagram? no
Ans: False

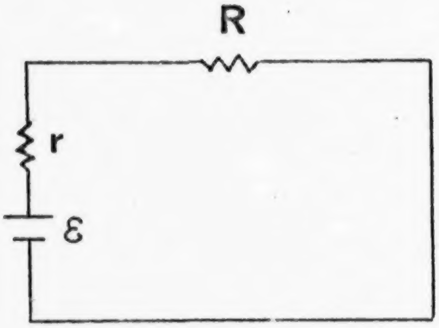
29-9.5 Electromotive force, emf, is defined as $E = -dq/dw$ where dw is the work done by the source of emf on a charge dq, in moving this charge from a lower to a higher potential.

☐ True ☐ False

ID# 29-9.5
TO# 087-00
Skill 0 Type
Diagram? no
Ans: False

USNA Accepts
Ques. Proofed Sn

29-15.4



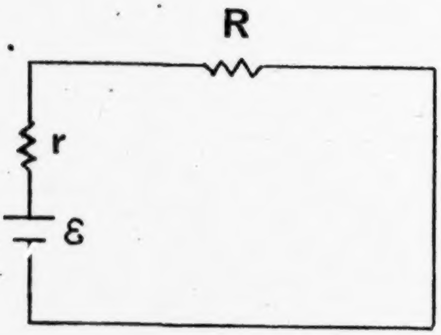
In the circuit shown, the emf ε = 50 volt. The voltage drop across the resistor r is 10 volts. If R = 80 ohm what is the joule heating in R?

P = _____ watt

ID# 29-15.4
TO# 089-00
Skill 1 Type_____
Diagram? yes
Ans: 20

USNA Accepts_____
Ques. Proofed SN
If revised after student use:
Date:_____
New Card used?_____
NYIT. Fall 1970

29-15.5



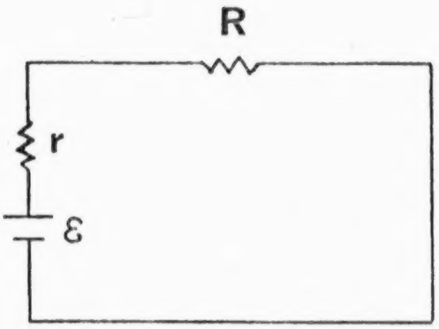
In the circuit shown, ε = 40 volt, r = 5 ohm and R = 75 ohm. What current flows through the resistor R?

i = ________ amp

ID# 29-15.5
TO# 089-00
Skill 1 Type_____
Diagram? yes
Ans: 0.5

USNA Accepts_____
Ques. Proofed SN
If revised after student use:
Date:_____
New Card used?_____
NYIT. Fall 1970

29-15.1

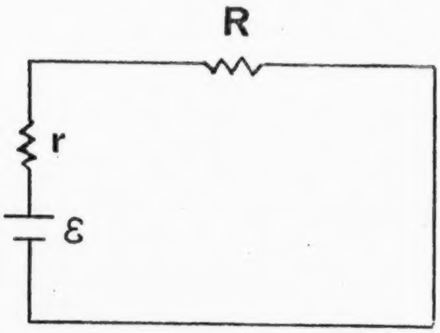


In the circuit shown a current i = 2.0 amp flows through the resistor R = 50 ohm. If ε = 106 volts what is the resistance r?

r = _______ ohm

ID# 29-15.1
TO# 089-00
Skill 1 Type____
Diagram? yes
Ans: 3.0

29-15.2

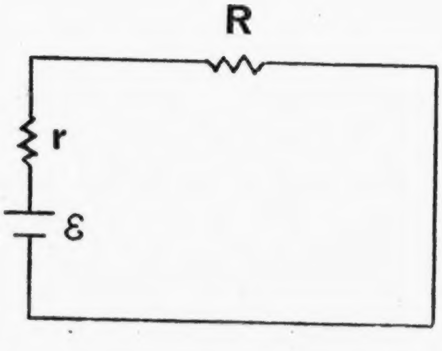


In the circuit shown ε = 100 volt, r = 4 ohm, and R = 46 ohm. What is the voltage drop across the resistor R?

v = ______ volt

ID# 29-15.2
TO# 089-00
Skill 1 Type____
Diagram? yes
Ans: 92

29-15.3



In the circuit shown r = 2.0 ohm, R = 13 ohm and a current i = 5.0 amp flows through the circuit. What is the emf ε?

ε = ______ volt

ID# 29-15.3
TO# 089-00
Skill 1 Type____
Diagram? yes
Ans: 75

USNA Accepts______
Ques. Proofed SW
If revised after

30-1.1

A circuit consists of three resistors, $R_1$, $R_2$, and $R_3$. The current in $R_2$ and $R_3$ is found to be inversely proportional to their respective resistance. The current in $R_1$ is equal to the sum of the currents in $R_2$ and $R_3$. This means that

A. All three resistors are connected in parallel

B. All three resistors are connected in series.

C. The resistors $R_2$ and $R_3$ are connected in parallel and this combination is in series with $R_1$.

D. The resistors $R_2$ and $R_3$ are in series and this combination is in parallel with $R_1$.

ID# 30-1.1
TO# 086-00
Skill 0 Type
Diagram? no
Ans: C

USNA Accepts
Ques. Proofed SN
If revised after student use:
Date:
New Card used?
NYIT. Fall 1970

30-1.2

A circuit consists of three resistors $R_1$, $R_2$, and $R_3$. The current in each resistor is found to be inversely proportional to its resistance. This means that

A. All three resistances are connected in series.

B. All three resistances are connected in parallel.

C. The first two resistances are connected in series and the combination is in parallel with the third resistor.

D. No conclusion can be reached from the data given.

ID# 30-1.2
TO# 086-00
Skill 0 Type
Diagram? no
Ans: B

USNA Accepts
Ques. Proofed SN
If revised after student use:
Date:
New Card used?
NYIT. Fall 1970

30-1.3

A circuit consists of three resistors $R_1$, $R_2$, and $R_3$. The current is found to be identical in each resistance. The voltage drop across each resistance is different. This means that

A. All three resistances are connected in parallel.

B. All three resistances are connected in series.

C. The resistors $R_1$ and $R_2$ are connected in series and this combination is in parallel with $R_3$.

D. The resistors $R_1$ and $R_2$ are connected in parallel and this combination is in series with $R_3$.

ID# 30-1.3
TO# 086-00
Skill 0 Type____
Diagram? no
Ans: B

USNA Accepts____
Ques. Proofed SN
If revised after student use:
Date:____
New Card used?___
NYIT. Fall 1970

30-1.4

A circuit consists of three resistors $R_1$, $R_2$, and $R_3$. The voltage across $R_1$ and $R_2$ is identical. The current in $R_3$ is found to be equal to the sum of the currents in $R_1$ and $R_2$. This means that

A. All the resistors are connected in parallel.

B. All the resistors are connected in series.

C. The resistors $R_1$ and $R_2$ are connected in parallel and this combination is connected in series with $R_3$.

D. The resisters $R_1$ and $R_2$ are connected in series and this combination is connected in parallel with $R_3$.

ID# 30-1.4
TO# 086-00
Skill 0 Type____
Diagram? no
Ans: C

USNA Accepts____
Ques. Proofed SN
If revised after student use:
Date:____
New Card used?___
NYIT. Fall 1970

30-1.5

A circuit consists of three resistors $R_1$, $R_2$, and $R_3$. The currents through the resistors are such that $i_1 = i_2 \neq i_3$. The voltage drops are such that $V_1 \neq V_2 \neq V_3$ but $V_1 + V_2 = V_3$. This means

A. All the resistors are in parallel.

B. All the resistors are in series.

C. The resistors $R_1$ and $R_2$ are in parallel and this combination is in series with $R_3$.

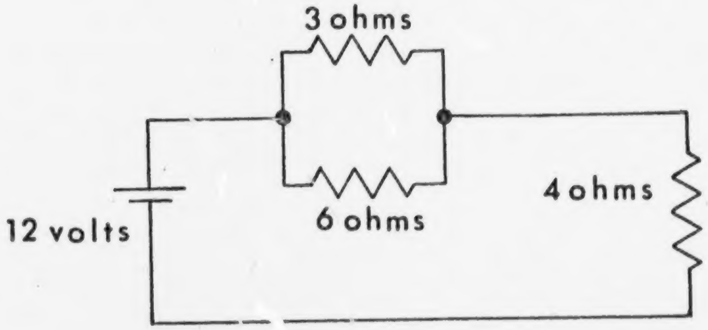
D. The resistors $R_1$ and $R_2$ are in series and this combination is in parallel with $R_3$.

ID# 30-1.5
TO# 086-00
Skill 0 Type
Diagram? no
Ans: D

USNA Accepts
Ques. Proofed SN
If revised after student use:
Date:
New Card used?
NYIT. Fall 1970

30-5.1

The equivalent resistance of the circuit shown is, in ohms.

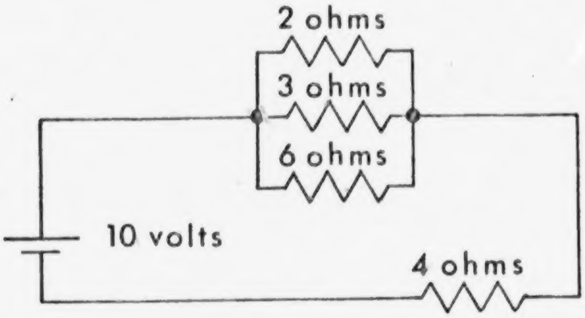


A. 13.0
B. 6.00
C. 2.47
D. 1.33

ID# 30-5.1
TO# 091-00
Skill 2 Type
Diagram? yes
Ans: B

USNA Accepts
Ques. Proofed SN
If revised after student use:
Date:
New Card used?
NYIT. Fall 1970

30-5.2 The equivalent resistance of the circuit shown is, in ohms

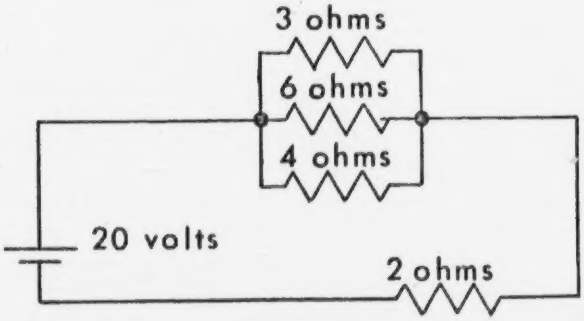

2 ohms
3 ohms
6 ohms
10 volts
4 ohms

A. 15.0
B. 5.00
C. 2.94
D. 0.80

ID# 30-5.2
TO# 091-00
Skill 2 Type
iagram? yes
ns: B

SNA Accepts
ues. Proofed SN
f revised after
student use:
te:
ew Card used?
IT. Fall 1970

30-5.3 The equivalent resistance of the circuit shown is, in ohms

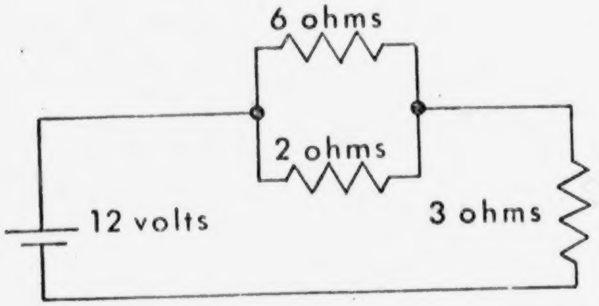

3 ohms
6 ohms
4 ohms
20 volts
2 ohms

A. 0.80
B. 2.75
C. 3.33
D. 15.0

ID# 30-5.3
TO# 091-00
Skill 2 Type
iagram? yes
ns: C

SNA Accepts
ues. Proofed SN
f revised aft
student use:
te:
ew Card used?
YIT. Fall 1970

30-5.4 The equivalent resistance of the circuit shown is, in ohms


6 ohms
2 ohms
12 volts
3 ohms

A. 1.00
B. 2.18
C. 4.50
D. 11.0

ID# 30-5.4
TO# 091-00
Skill 2 Type
Diagram? yes
Ans: C

USNA Accepts
Ques. Proofed SN
If revised after student use:
Date:
New Card used?
NYIT. Fall 1970

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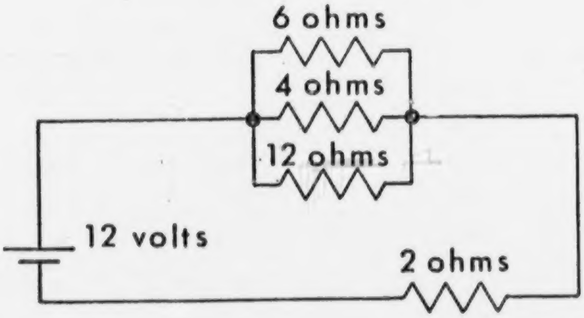
30-5.5 The equivalent resistance of the circuit shown is, in ohms

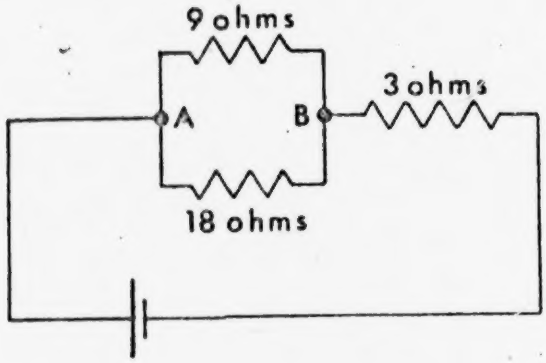

6 ohms
4 ohms
12 ohms
12 volts
2 ohms

A. 1.00
B. 2.50
C. 4.00
D. 24.0

ID# 30-5.5
TO# 091-00
Skill 2 Type
Diagram? yes
Ans: C

USNA Accepts
Ques. Proofed SN
If revised after student use:
Date:
New Card used?
NYIT. Fall 1970

30-10.1 In this circuit the voltage drop across the 3 ohm resistor is



A. equal to $V_{AB}$

B. twice $V_{AB}$

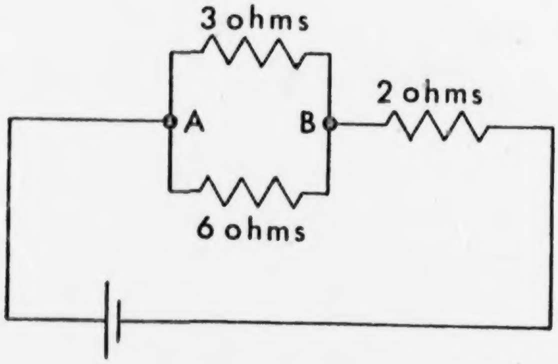
C. one-half $V_{AB}$

D. Zero

ID# 30-10.1
TO# 086-00
Skill 1 Type
Diagram? yes
Ans: C

USNA Accepts
Ques. Proofed SN
If revised after student use:
Date:
New Card used?
YIT. Fall 1970

30-10.2 In this circuit the voltage drop across the 2 ohms resistor is



A. greater than $V_{AB}$

B. less than $V_{AB}$

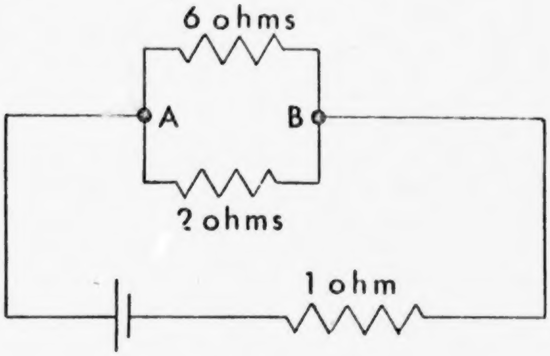
C. equal to $V_{AB}$

D. Zero

ID# 30-10.2
TO# 091-06
Skill 1 Type
Diagram? yes
Ans: C

USNA Accepts
Ques. Proofed SN
If revised after student use:
Date:
New Card used?
YIT. Fall 1970

30-10.3 In this circuit the voltage across the 1 ohm resistor is



A. greater than $V_{AB}$

B. less than $V_{AB}$

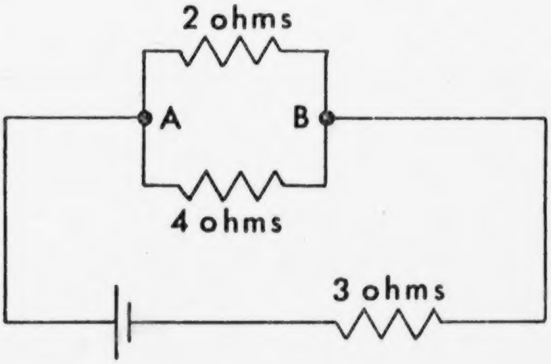
C. equal to $V_{AB}$

D. Zero

ID# 30-10.3
TO# 091-06
Skill 1 Type
Diagram? yes
Ans: B

USNA Accepts
Ques. Proofed SN
If revised after student use:
Date:
New Card used?
XVII. Fall 1970

30-10.4 In this circuit the voltage drop across the 3 ohms resistor is



A. greater than $V_{AB}$

B. less than $V_{AB}$

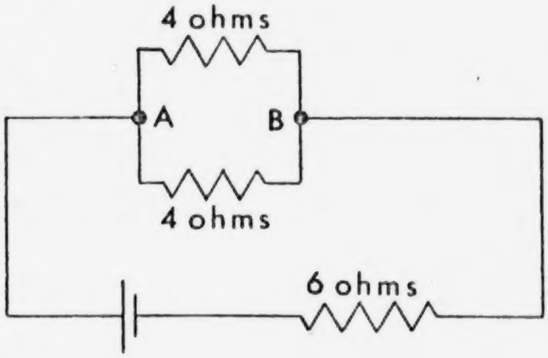
C. equal to $V_{AB}$

D. Zero

ID# 30-10.4
TO# 091-06
Skill 1 Type
Diagram? yes
Ans: A

USNA Accepts
Ques. Proofed SN
If revised after student use:
Date:
New Card used?
XVII. Fall 1970

30-10.5 In this circuit the voltage drop across the 6 ohms resistor is



A. 1/3 $V_{AB}$

B. 2/3 $V_{AB}$

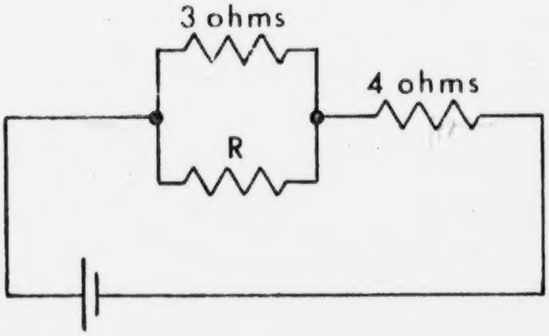
C. 1.5 $V_{AB}$

D. 3 $V_{AB}$

ID# 30-10.5
TO# 091-06
Skill 1 Type
Diagram? yes
Ans: D

USNA Accepts
Ques. Proofed SN
If revised after student use:
Date:
New Card used?
NYIT. Fall 1970

30-16.1



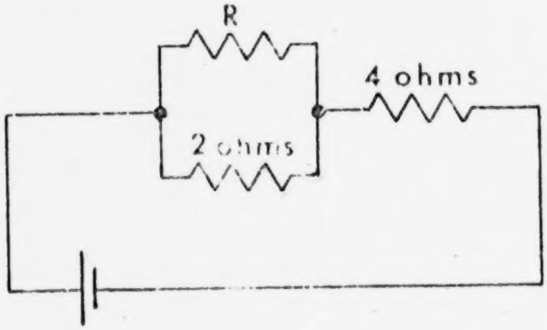
The value of the resistance R such that the current in the resistance R is *one third* the current in the 4 ohm resistance is, in ohms

A. 12.0
B. 6.00
C. 1.50
D. 1.33

ID# 30-16.1
TO# 091-00
Skill 2 Type
Diagram? yes
Ans: B

USNA Accepts
Ques. Proofed SN
If revised after student use:
Date:
New Card used?
NYIT. Fall 1970

30-16.2



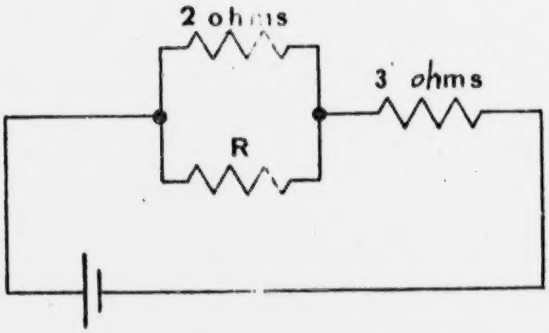
The value of the resistance R such that the current in the 4 ohm resistance is *four* times the current in the resistance R is, in ohms

A. 0.67
B. 1.0
C. 6.0
D. 16

ID# 30-16.2
TO# 091-00
Skill 2 Type
iagram? yes
ns: C

SNA Accepts
ues. Proofed SN
f revised after
student use:
ate:
ew Card used?
IT, Fall 1970

30-16.3



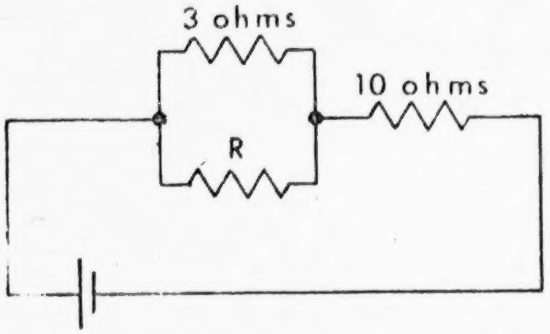
The value of the resistance R such that the current in the 3 ohm resistance is *three* times the current in the resistance R is, in ohms

A. 1.0
B. 4.0
C. 6.0
D. 9.0

ID# 30-16.3
TO# 091-00
kill 2 Type
Diagram? yes
ns: B

SNA Accepts
ues. Proofed SN
f revised after
student use:
ate:
ew Card used?
IT, Fall 1970

30-16.4



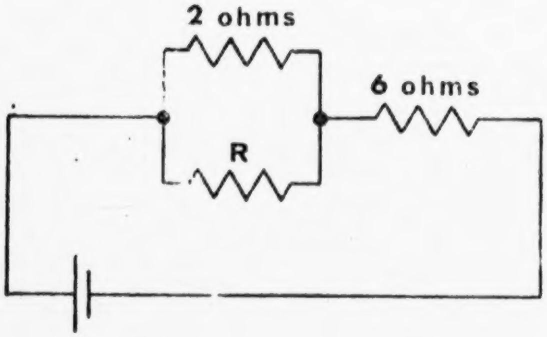
The value of the resistance R such that the current in the 10 ohm resistance is *five* times the current in the resistance R is, in ohms

A. 50
B. 15
C. 12
D. 20

ID# 30-16.4
TO# 091-00
Skill 2 Type
Diagram? yes
Ans: C

USNA Accepts
Ques. Proofed SN
If revised after student use:
Date:
New Card used?
NYIT. Fall 1970

30-16.5



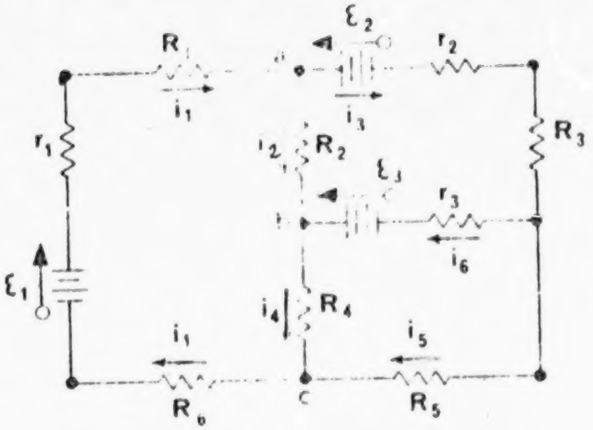
The value of the resistance R such that the current in the 6 ohm resistance is *twice* the current in the resistance R is, in ohms

A. 12
B. 4.0
C. 3.0
D. 2.0

ID# 30-16.5
TO# 091-00
Skill 2 Type
Diagram? yes
Ans: D

USNA Accepts
Ques. Proofed SN
If revised after student use:
Date:
New Card used?
NYIT. Fall 1970

30-19.1


$\mathcal{E}_2$
R1
$r_2$
$i_1$
$i_3$
$R_3$
$i_2$
$R_2$
$\mathcal{E}_3$
$r_3$
$i_6$
$\mathcal{E}_1$
$i_4$
$R_4$
$i_1$
$i_5$
c
$R_6$
$R_5$

The circuit equations for the *two* branch points a and b in the accompanying circuit are

A. $i_1 - i_2 - i_3 = 0;\ i_2 + i_6 - i_4 = 0$

B. $i_1 + i_2 + i_3 = 0;\ i_2 + i_6 + i_4 = 0$

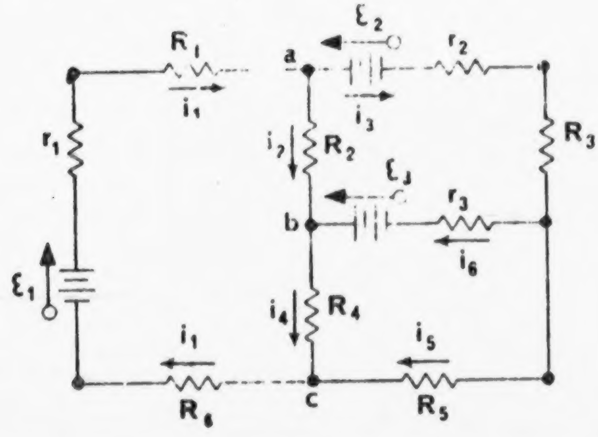
C. $i_1 - i_2 - i_3 = 0;\ i_2 - i_6 - i_4 = 0$

D. $i_1 - i_2 + i_3 = 0;\ i_2 - i_6 + i_4 = 0$

ID# 30-19.1
TO# 093-00
Skill 1 Type
Diagram? yes
Ans: A

USNA Accepts
Ques. Proofed SN
If revised after student use:
Date:
New Card used?
NYIT. Fall 1970

30-19.2


$\mathcal{E}_2$
$R_1$
a
$r_2$
$i_1$
$i_3$
$R_3$
$r_1$
$i_2$
$R_2$
$\mathcal{E}_3$
$r_3$
b
$i_6$
$\mathcal{E}_1$
$i_4$
$R_4$
$i_1$
$i_5$
$R_6$
c
$R_5$

The circuit equations for the *two* branch points a and c in the accompanying diagram are

A. $i_1 + i_2 + i_3 = 0;\ i_1 + i_4 + i_5 = 0$

B. $i_1 - i_2 - i_3 = 0;\ -i_1 + i_4 + i_5 = 0$

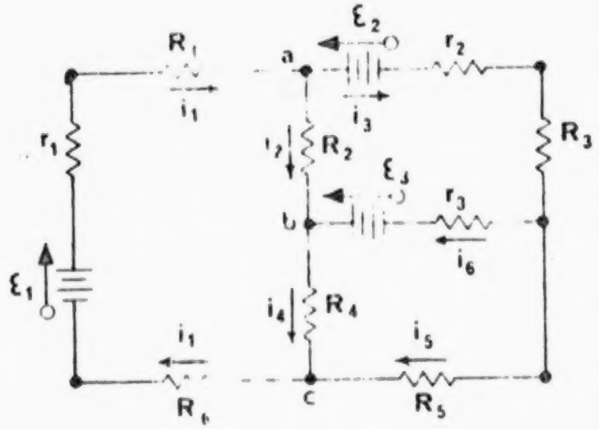
C. $i_1 - i_2 - i_3 = 0;\ i_1 - i_4 - i_5 = 0$

D. $i_1 + i_2 - i_3 = 0;\ -i_1 + i_2 + i_4 + i_5 = 0$

ID# 30-19.2
TO# 093-00
Skill 1 Type
Diagram? yes
Ans: B

USNA Accepts
Ques. Proofed SN
If revised after student use:
Date:
New Card used?
NYIT. Fall 1970

30-19.3


R₁
a
ε₂
r₂
i₁
i₃
r₁
i₂
R₂
R₃
ε₃
r₃
b
i₆
ε₁
i₄
R₄
i₁
i₅
R₆
c
R₅

The circuit equations for the *two* branch points b and c. in the accompanying diagram are

A. $i_2 + i_4 + i_6 = 0;\ i_1 + i_4 + i_5 = 0$

B. $i_2 + i_4 - i_6 = 0;\ i_1 - i_4 - i_5 = 0$

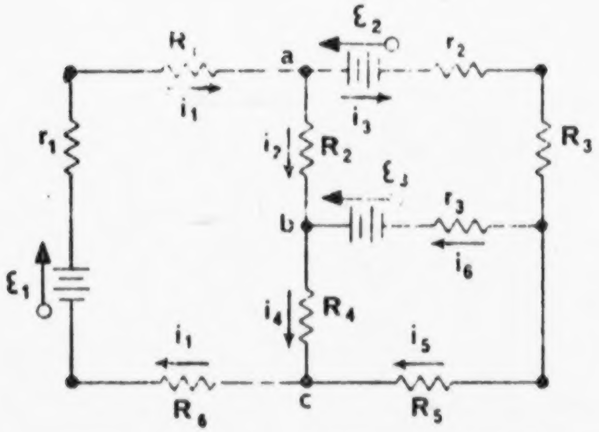
C. $i_2 - i_4 + i_6 = 0;\ -i_1 + i_4 + i_5 = 0$

D. $i_2 - i_4 + i_6 = 0;\ -i_1 + i_2 + i_4 + i_5 = 0$

ID# 30-19.3
TO# 093-00
Skill 1 Type
Diagram? yes
Ans: C

USNA Accepts
Ques. Proofed SN
If revised after student use:
Date:
New Card used?
NYIT. Fall 1970

30-19.4


R₁
a
ε₂
r₂
i₁
i₃
r₁
i₂
R₂
R₃
ε₃
r₃
b
i₆
ε₁
i₄
R₄
i₁
i₅
R₆
c
R₅

The circuit equations for the *two* branch points a and b in the accompanying circuit are

A. $i_1 - i_2 + i_3 = 0;\ i_2 - i_6 + i_4 = 0$

B. $i_1 + i_2 + i_3 = 0;\ i_2 + i_6 + i_4 = 0$

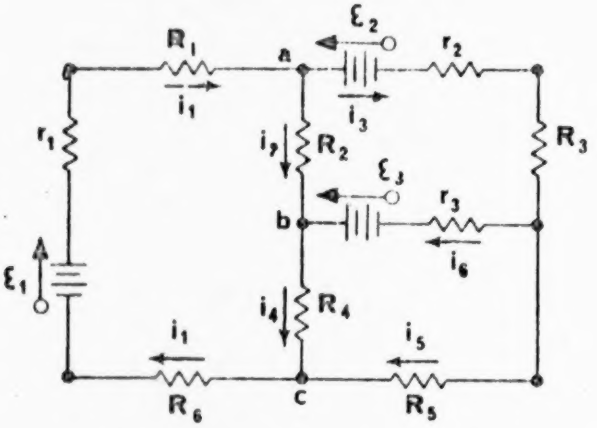
C. $i_1 - i_2 - i_3 = 0;\ i_2 - i_6 - i_4 = 0$

D. $i_1 - i_2 - i_3 = 0;\ i_2 + i_6 - i_4 = 0$

ID# 30-19.4
TO# 093-00
Skill 1 Type
Diagram? yes
Ans: D

USNA Accepts
Ques. Proofed SN
If revised after student use:
Date:
New Card used?
NYIT. Fall 1970

30-19.5


R1
i1
a
ℰ2
r2
i3
r1
i2
R2
R3
ℰ3
b
r3
i6
ℰ1
i4
R4
i1
i5
R6
c
R5

The circuit equations for the *two* branch points a and c in the accompanying diagram are

A. $i_1 + i_2 + i_3 = 0$; $i_1 + i_4 + i_5 = 0$

B. $i_1 + i_2 - i_3 = 0$; $-i_1 + i_2 + i_4 + i_5 = 0$

C. $i_1 - i_2 - i_3 = 0$; $i_1 - i_4 - i_5 = 0$

D. $i_1 - i_2 - i_3 = 0$; $-i_1 + i_4 + i_5 = 0$

ID# 30-19.5

TO# 093-00

Skill 1 Type______

Diagram? yes

Ans: D

USNA Accepts______

Ques. Proofed SN

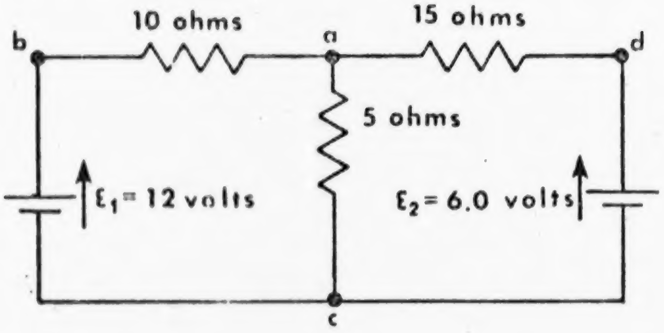
If revised after student use:

Date:______

New Card used?______

NYIT. Fall 1970

30-23.1


10 ohms
15 ohms
b
a
d
5 ohms
ℰ1 = 12 volts
ℰ2 = 6.0 volts
c

In the circuit shown the current through the 10 ohm resistor is, in amps

A. 0.109
B. 0.765
C. 0.800
D. 0.870

ID# 30-23-1

TO# 093-02

Skill 2 Type______

Diagram? yes

Ans: B

USNA Accepts______

Ques. Proofed SN

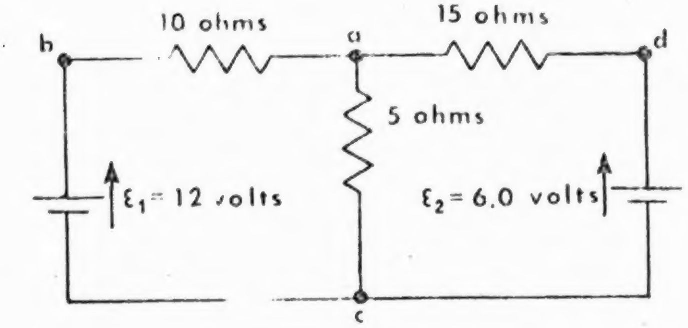
If revised after student use:

Date:______

New Card used?______

NYIT. Fall 1970

30-23.2



b
10 ohms
a
15 ohms
d
5 ohms
$\mathcal{E}_1 = 12$ volts
$\mathcal{E}_2 = 6.0$ volts
c

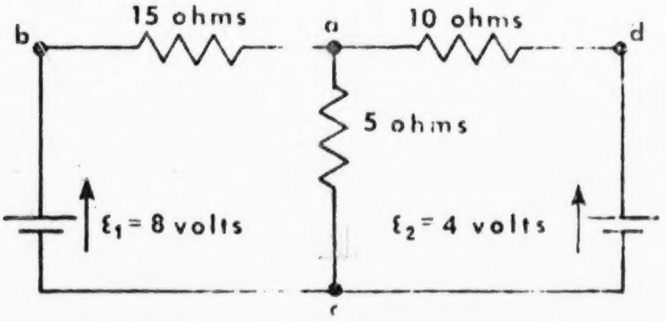
In the circuit shown the current through the 15 ohm resistor is, in amps

A. 0.870
B. 0.765
C. 0.300
D. 0.109

ID# 30-23.2
TO# 093-02
Skill 2 Type____
Diagram? yes
Ans: D

JSNA Accepts SN
Ques. Proofed____
f revised after
student use:
ate:____
ew Card used?__
YIT. Fall 1970

30-23.3



b
15 ohms
a
10 ohms
d
5 ohms
$\mathcal{E}_1 = 8$ volts
$\mathcal{E}_2 = 4$ volts
c

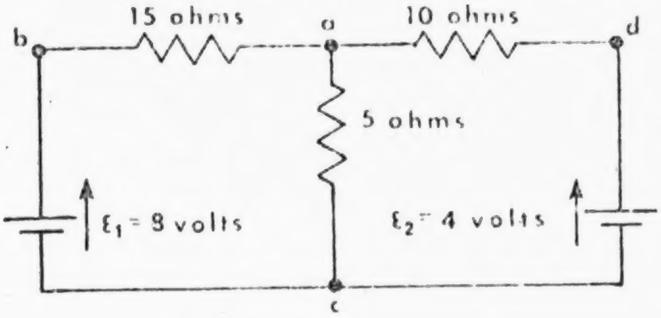
In the circuit shown the current through the 50 ohm resistor is, in amps

A. 0.667
B. 0.510
C. 0.363
D. 0.145

ID# 30-23-3
TO# 093-02
Skill 2 Type____
Diagram? yes
Ans: C

JSNA Accepts____
Ques. Proofed SN
f revised after
student use:
ate:____
ew Card used?__
YIT. Fall 1970

30-23.4


15 ohms
a
10 ohms
b
d
5 ohms
$\mathcal{E}_1 = 8$ volts
$\mathcal{E}_2 = 4$ volts
c

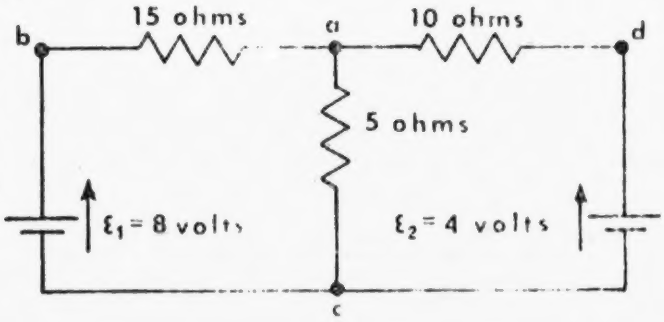
In the circuit shown the current through the 10 ohm resistor is, in amps

A. 0.510
B. 0.363
C. 0.267
D. 0.145

ID# 30-23.4
TO# *093-02*
Skill 2 Type
Diagram? yes
Ans: D

USNA Accepts
Ques. Proofed *SN*
If revised after student use:
Date:
New Card used?
NIT, Fall 1970

30-23.5


15 ohms
a
10 ohms
b
d
5 ohms
$\mathcal{E}_1 = 8$ volts
$\mathcal{E}_2 = 4$ volts
c

In the circuit shown the current through the 15 ohm resistor is, in amps

A. 0.510
B. 0.400
C. 0.363
D. 0.145

ID# 30-23.5
TO# *093-02*
Skill 2 Type
Diagram? yes
Ans: C

USNA Accepts
Ques. Proofed *SN*
If revised after student use:
Date:
New Card used?
NIT, Fall 1970

31-1.1 The resistance of the coil of a pivoted coil galvanometer is 20 ohms and a current of 1.0 milliampere causes a full-scale deflection. In order to convert this galvanometer into an ammeter reading 5.0 amps full-scale one would connect a resistance of

A. $10^5$ ohms in series with the coil.
B. $10^5$ ohms in parallel with the coil.
C. $4 \times 10^{-3}$ ohms in series with the coil.
D. $4 \times 10^{-3}$ ohms in parallel with the coil.

ID# 31-1.1
TO# 094-00
Skill 2 Type
Diagram? no
Ans: D

USNA Accepts
Ques. Proofed SN

31-1.2 The resistance of the coil of a pivoted coil galvanometer is 25 ohms and a current of 2.0 milliampere causes a full-scale deflection. In order to convert this galvanometer into an ammeter reading 12.5 amps full-scale one would convert a resistance of

A. $1.56 \times 10^5$ ohms in series with the coil.

B. $1.56 \times 10^5$ ohms in parallel with the coil.

C. $4 \times 10^{-3}$ ohms in series with the coil.

D. $4 \times 10^{-3}$ ohms in parallel with the coil.

ID# 31-1.2
TO# 094-00
Skill 2 Type
Diagram? no
Ans: D

31-1.3 The resistance of the coil of a pivoted coil galvanometer is 20 ohms and a current of 2.0 milliampere causes a full-scale deflection. In order to convert this galvanometer into an ammeter reading 4.0 amps full-scale one would connect a resistance of

A. $10^{-2}$ ohms in series with the coil.

B. $10^{-2}$ ohms in parallel with the coil.

C. $4 \times 10^4$ ohms in series with the coil.

D. $4 \times 10^{-4}$ ohms in parallel with the coil.

ID# 31-1.3
TO# 094-00
Skill 2 Type
Diagram? no
Ans: B

31-1.4 The resistance of the coil of a pivoted coil galvanometer is 30 ohms and a current of 3.0 milliampere causes a full-scale deflection. In order to convert this galvanometer into an ammeter reading 5.0 amps full-scale one would connect a resistance of

A. $1.8 \times 10^{-2}$ ohms in series with the coil.

B. $1.8 \times 10^{-2}$ ohms in parallel with the coil.

C. $5 \times 10^{4}$ ohms in series with the coil.

D. $5 \times 10^{4}$ ohms in parallel with the coil.

ID# 31-1.4
TO# 094-00
Skill 2 Type
Diagram? no
Ans: B

31-1.5 The resistance of the coil of a pivoted coil galvanometer is 10 ohms and a current of 1.0 milliampere causes a full-scale deflection. In order to convert this galvanometer into an ammeter reading 2.5 amps full-scale one would connect a resistance of

A. $4 \times 10^{-3}$ ohms in series with the coil.

B. $4 \times 10^{-3}$ ohms in parallel with the coil.

C. $2.5 \times 10^{4}$ ohms in series with the coil.

D. $2.5 \times 10^{4}$ ohms in parallel with the coil.

ID# 31-1.5
TO# 094-00
Skill 2 Type
Diagram? no
Ans: B

USNA Accepts

31-7.1 A 150-volt voltmeter has a resistance of 20,000 ohms. In order to convert this into a voltmeter reading 25 volts full-scale when across a 110-volt line one would connect a resistance of

A. 4.4 ohms in series with the voltmeter.

B. 4.4 ohms in parallel with the voltmeter.

C. $6.2 \times 10^{4}$ ohms in series with the voltmeter.

D. $6.2 \times 10^{4}$ ohms in parallel with the voltmeter.

ID# 31-7.1
TO# 095-00
Skill 1 Type
Diagram? no
Ans: C

USNA Accepts

31-7.2 A 150-volt voltmeter has a resistance of 20,000 ohms. In order to convert this into a voltmeter reading 10 volts full-scale when across a 110-volt line one would connect a resistance of

A. $2 \times 10^5$ ohms in parallel with the voltmeter.

B. $2 \times 10^5$ ohms in series with the voltmeter.

C. 11 ohms in parallel with the voltmeter.

D. 11 ohms in series with the voltmeter.

ID# 31-7.2
TO# 095-00
Skill 1 Type____
Diagram? no
Ans: B

31-7.3 A 100-volt voltmeter has a resistance of 15,000 ohms. In order to convert this into a voltmeter reading 15 volts full-scale when across a 110-volt line one would connect a resistance of

A. $9.5 \times 10^4$ ohms in series with the voltmeter.

B. $9.5 \times 10^4$ ohms in parallel with the voltmeter.

C. 7.35 ohms in series with the voltmeter.

D. 7.35 ohms in parallel with the voltmeter.

ID# 31-7.3
TO# 095-00
Skill 1 Type____
Diagram? no
Ans: A

==================
USNA Accepts

31-7.4 A 100-volt voltmeter has a resistance of 20,000 ohms. In order to convert this into a voltmeter reading 5 volts full-scale when across a 100-volt line one would connect a resistance of

A. 20 ohms in series with the voltmeter.

B. 20 ohms in parallel with the voltmeter.

C. $3.8 \times 10^5$ ohms in series with the voltmeter.

D. $3.8 \times 10^5$ ohms in parallel with the voltmeter.

ID# 31-7.4
TO# 095-00
Skill 1 Type____
Diagram? no
Ans: C

==================
USNA Accepts____
Ques. Proofed SN

31-7.5 A 100-volt voltmeter has a resistance of 20,000 ohms. In order to convert this into a voltmeter reading 5 volts full-scale when across a 30-volt line one would connect a resistance of

A. 6 ohms in series with the voltmeter.

B. 6 ohms in parallel with the voltmeter.

C. $10^5$ ohms in series with the voltmeter.

D. $10^5$ ohms in parallel with the voltmeter.

ID# 31-7.5

TO# 095-00

Skill 1 Type____

Diagram? no

Ans: C

USNA Accepts____

Ques. Proofed SN

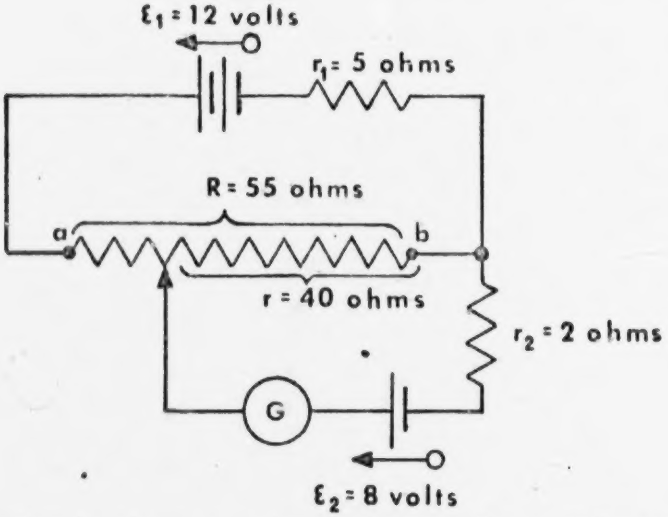
If revised after student use:

Date:____

New Card used?____

NYIT. Fall 1970

31-11.1


$\varepsilon_1 = 12$ volts
$r_1 = 5$ ohms
R = 55 ohms
a
b
r = 40 ohms
$r_2 = 2$ ohms
G
$\varepsilon_2 = 8$ volts

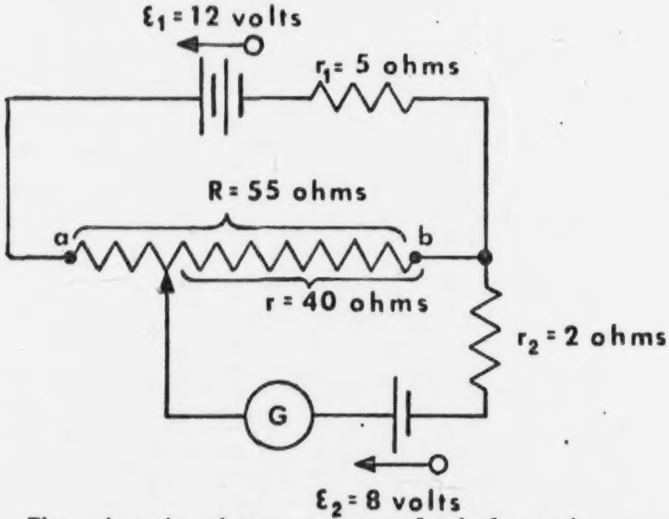
The circuit shows a properly balanced potentiometer. The current through resistor $r_2$ will be, in amps

A. 4.0
B. 1.7
C. 0.2
D. Zero

ID# 31-11.1
TO#
Skill 1 Type
Diagram? yes
Ans: D

USNA Accepts
Ques. Proofed SN
If revised after student use:
Date:
New Card used?
NYIT. Fall 1970

31-11.2


$\varepsilon_1 = 12$ volts
$r_1 = 5$ ohms
R = 55 ohms
a
b
r = 40 ohms
$r_2 = 2$ ohms
G
$\varepsilon_2 = 8$ volts

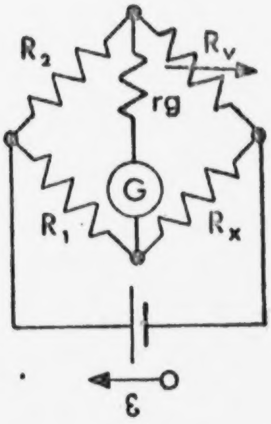
The circuit shows a properly balanced potentiometer. The potential drop across resistor $R_2$ will be, in volts

A. 8.0
B. 3.4
C. 0.4
D. Zero

ID# 31-11.2
TO# 095-00
Skill 1 Type
Diagram? yes
Ans: D

USNA Accepts
Ques. Proofed SN
If revised after student use:
Date:
New Card used?
NYIT. Fall 1970

31-15.1



In the Wheatstone Bridge illustrated the variable resistor $R_V$ has been adjusted so that the galvanometer reads zero. If $R_1 = 6 \times 10^5$ ohms; $R_2 = 600$ ohms; $R_V = 1600$ ohms; the value of $R_x$ is, in ohms

A. 1.6
B. $1.6 \times 10^3$
C. $1.6 \times 10^6$
D. $2.25 \times 10^6$

ID# 31-15.1
IO#________
Skill 2 Type______
Diagram? yes
Ans: C

USNA Accepts______
Ques. Proofed SN
If revised after student use:
Date:________
New Card used?____
NYIT. Fall 1970

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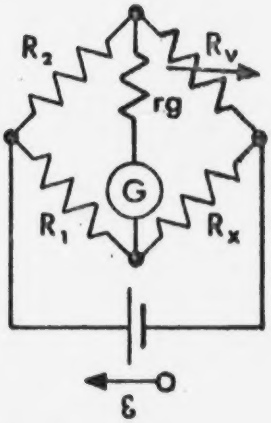
31-15.2



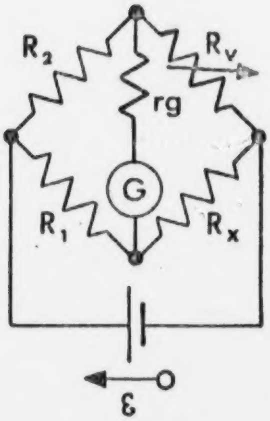
In the Wheatstone Bridge illustrated the variable resistor $R_V$ has been adjusted so that the galvanometer reads zero. If $R_1 = 7.5 \times 10^5$ ohms; $R_2 = 250$ ohms; $R_V = 1300$ ohms; the value of $R_x$ is, in ohms

A. 0.43
B. $1.3 \times 10^3$
C. $1.44 \times 10^5$
D. $3.9 \times 10^6$

ID# 31-15.2
IO# 096-00
Skill 2 Type______
Diagram? yes
Ans: D

USNA Accepts______
Ques. Proofed SN
If revised after student use:
Date:________
New Card used?____
NYIT. Fall 1970

31-15.3



In the Wheatstone Bridge illustrated the variable resistor $R_v$ has been adjusted so that the galvanometer reads zero. If $R_1 = 8 \times 10^5$ ohms; $R_2 = 800$ ohms; $R_v = 1200$ ohms; the value of $R_x$ is, in ohms

A. $1.2 \times 10^6$
B. $5.34 \times 10^5$
C. $1.2 \times 10^3$
D. 1.2

ID# 31-15.3
TO# 096-00
Skill 2 Type
Diagram? yes
Ans: A

==================

USNA Accepts
Ques. Proofed SN
If revised after student use:
Date:
New Card used?
NYIT. Fall 1970

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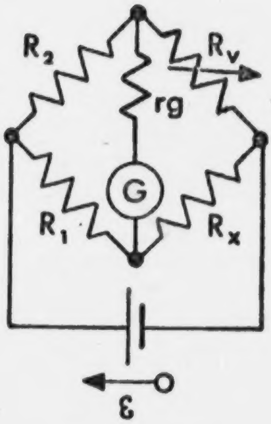
31-15.4



In the Wheatstone Bridge illustrated the variable resistor $R_v$ has been adjusted so that the galvanometer reads zero. If $R_1 = 9 \times 10^5$ ohms; $R_2 = 300$ ohms; $R_v = 1200$ ohms; the value of $R_x$ is, in ohms

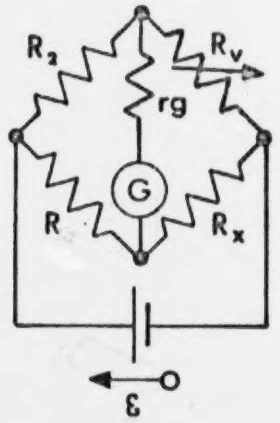
A. $3.6 \times 10^6$
B. $9 \times 10^5$
C. $2.25 \times 10^5$
D. 0.40

ID# 31-15.4
TO#
Skill 2 Type
Diagram? yes
Ans: A

==================

USNA Accepts
Ques. Proofed SN
If revised after student use:
Date:
New Card used?
NYIT. Fall 1970

31-15.5



In the Wheatstone Bridge illustrated the variable resistor $R_v$ has been adjusted so that the galvanometer reads zero. If $R_1 = 6 \times 10^5$ ohms; $R_2 = 600$ ohms; $R_v = 1300$ ohms; the value of $R_x$ is, in ohms

A. 1.30
B. $2.76 \times 10^5$
C. $6.00 \times 10^5$
D. $1.30 \times 10^6$

ID# 31-15.5
TO# 096-00
Skill 2 Type
Diagram? yes
Ans: D

USNA Accepts
Ques. Proofed SN
If revised after student use:

Date:
New Card used?
NYIT. Fall 1970

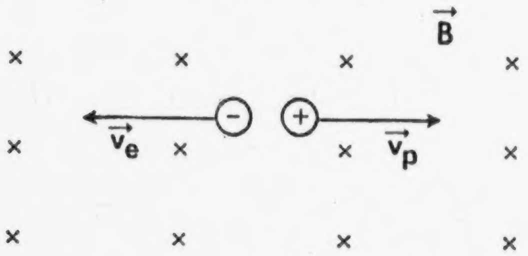
32-4.1 A positron is a particle of the same mass as an electron but positively charged. A positron and an electron are released in a uniform magnetic field (directed into the paper) moving as indicated on the diagram. If $v_p = v_e$ one may say that

A. The positron rotates clockwise, the electron counterclockwise; $R_p = R_e$.

B. The positron rotates counterclockwise, the electron clockwise; $R_p = R_e$.

C. Both particles rotate clockwise; $R_p = R_e$.

D. Both particles rotate counterclockwise; $R_p = R_e$.



ID# 32-4.1

TO# 106-00

Skill 1 Type

Diagram? yes

Ans: B

USNA Accepts

Ques. Proofed SN

If revised after student use:

Date:

New Card used?

NYIT. Fall 1970

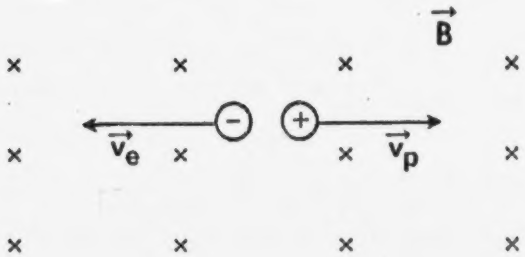
32-4.2 A positron is a particle of the same mass as an electron but positively charged. A positron and an electron are released in a uniform magnetic field (directed into the paper) moving as indicated on the diagram. If $v_p = 2\ v_e$ one may say that

A. The positron rotates clockwise, the electron counterclockwise; $R_p = 2\ R_e$.

B. The positron rotates clockwise, the electron counterclockwise; $R_p = (1/2)\ R_e$

C. The positron rotates counterclockwise, the electron clockwise; $R_p = 2\ R_e$.

D. The positron rotates counterclockwise, the electron clockwise; $R_p = (1/2)\ R_e$.



ID# 32-4.2

TO# 106-00

Skill 1 Type

Diagram? yes

Ans: C

USNA Accepts

Ques. Proofed SN

If revised after student use:

Date:

New Card used?

NYIT. Fall 1970

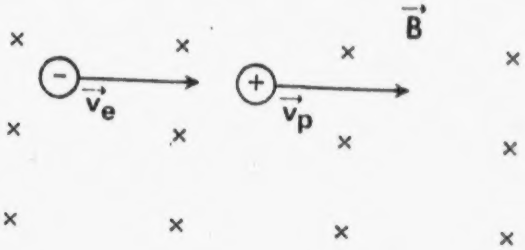
32-4.3 A positron is a particle of the same mass as an electron but positively charged. A positron and an electron are released in a uniform magnetic field (directed into the paper) moving as indicated on the diagram. If $v_p = 3\ v_e$ one may say that

A. The positron rotates clockwise, the electron counterclockwise; $R_p = (1/3)\ R_e$.

B. The positron rotates clockwise, the electron counterclockwise; $R_p = 3\ R_e$.

C. The positron rotates counterclockwise, the electron clockwise; $R_p = 3\ R_e$.

D. The positron rotates counterclockwise, the electron clockwise; $R_p = (1/3)\ R_e$.



ID# 32-4.3
TO# 106-00
Skill 1 Type_____
Diagram? yes
Ans: C

USNA Accepts_____
Ques. Proofed SN
If revised after student use:
Date:_____
New Card used?_____
NYIT. Fall 1970

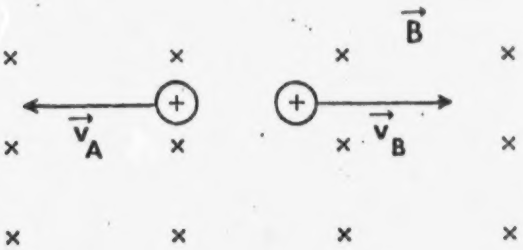
32-4.4 A positron is a particle of the same mass as an electron but positively charged. Two positrons (A and B) are released in a uniform magnetic field (directed into the paper) moving as indicated on the diagram. If $v_A = v_B$ one may say that

A. Positron A rotates clockwise, positron B counterclockwise; $R_A = R_B$.

B. Positron A rotates counterclockwise, positron B clockwise; $R_A = R_B$.

C. Both positrons rotate counterclockwise; $R_A = R_B$.

D. Both positrons rotate clockwise; $R_A = R_B$.



ID# 32-4.4
TO# 106-00
Skill 1 Type_____
Diagram? yes
Ans: C

USNA Accepts_____
Ques. Proofed SN
If revised after student use:
Date:_____
New Card used?_____
NYIT. Fall 1970

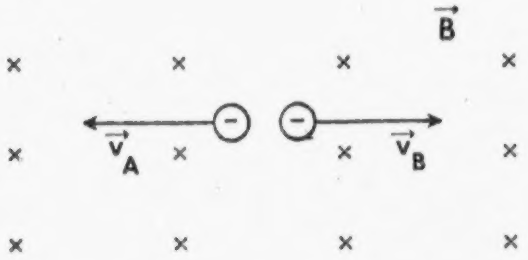
32-4.5 Two electrons (A and B) are released in a uniform magnetic field (directed into the paper) moving as indicated on the diagram. If $v_A = v_B$ one may say that

A. Both electrons rotate clockwise; $R_A = R_B$.

B. Both electrons rotate counterclockwise; $R_A = R_B$.

C. Electron A rotates clockwise, electron B counterclockwise; $R_A = R_B$.

D. Electron A rotates counterclockwise, electron B clockwise; $R_A = R_B$.



ID# 32-4.5
TO# 106-00
Skill 1 Type
Diagram? yes
Ans: A

USNA Accepts
Ques. Proofed SN
If revised after student use:
Date:
New Card used?
NYIT. Fall 1970

32-9.1 The operation of a cyclotron involves a charged particle rotating in a plane normal to a uniform magnetic field, B. With respect to the frequency of revolution of the charged particle (rev/sec) one may say that

A. $f \propto \frac{mv}{qB}$

B. $f \propto \frac{qB}{m}$

C. $f \propto \frac{qvB}{m}$

D. $f \propto \sqrt{\frac{qB}{m}}$

ID# 32-9.1
TO# 106-00
Skill 2 Type
Diagram? no
Ans: B

USNA Accepts
Ques. Proofed
If revised after student use:
Date:
New Card used?
NYIT. Fall 1970

32-9.2 The operation of a cyclotron involves a charged particle rotating in a plane normal to a uniform magnetic field, B. with respect to the frequency of revolution of the charged particle (rev/sec) one may say that

A. $f \propto \frac{qB}{m}$

B. $f \propto \frac{qB}{mv}$

C. $f \propto \frac{qvB}{m}$

D. $f \propto \sqrt{\frac{mv}{qB}}$

ID# 32-9.2

TO# 106-00

Skill 2 Type_____

Diagram? no

Ans: A

USNA Accepts_____

Ques. Proofed_____

If revised after

32-9.3 The operation of a cyclotron involves a charged particle rotating in a plane normal to a uniform magnetic field, B. With respect to the frequency of revolution of the charged particle (rev/sec) one may say that

A. $f \propto \frac{m}{qB}$

B. $f \propto \frac{Bv}{m}$

C. $f \propto \frac{qB}{m}$

D. $f \propto \sqrt{\frac{mv}{qB}}$

ID# 32-9.3

TO# 106-00

Skill 2 Type_____

Diagram? no

Ans: C

32-9.4 The operation of a cyclotron involves a charged particle rotating in a plane normal to a uniform magnetic field, B. With respect to the frequency of revolution of the charged particle (rev/sec) one may say that

A. $f \propto \frac{qB}{mv}$

B. $f \propto \frac{qvB}{m}$

C. $f \propto \sqrt{\frac{qB}{m}}$

D. $f \propto \frac{qB}{m}$

ID# 32-9.4

TO# 106-00

Skill 2 Type_____

Diagram? no

Ans: D

32-9.5 The operation of a cyclotron involves a charged particle rotating in a plane normal to a uniform magnetic field, B. With respect to the frequency of revolution of the charged particle (rev/sec) one may say that

A. $f \propto \frac{m}{qvB}$

B. $f \propto \frac{qB}{m}$

C. $f \propto \frac{mv}{qB}$

D. $f \propto \sqrt{\frac{qvB}{m}}$

ID# 32-9.5

TO# 106-00

Skill 2 Type______

Diagram? no

Ans: B

USNA Accepts______

Ques. Proofed______

If revised after student use:

Date:______

New Card used?____

NYIT, Fall 1970

STUDENT T.O. KEY SHEET

SEGMENT NUMBER - CORE PROBLEM NUMBER *

NAME ______________________

ACADEMY NUMBER ______________________

| T.O. | SEG. # - CORE PROB. |
|---|---|
| 1 | 1-13 |
| 2 | 2-17 |
| 3 | 1-1 |
| 4 | 2-1; 2-6 |
| 5 | 2-10; 2-14 |
| 6 | 3-1; 3-6; 3-9 |
| 7 | 3-1; 3-6; 3-9 |
| 8 | 1-13 |
| 9 | 3-1; 3-6 |
| 10 | 3-17 |
| 11 | 2-14 |
| 12 | 3-12; 3-18 |
| 13 | 4-1; 4-2 |
| 14 | 4-5; 4-6 |
| 15 | 4-11 |
| 16 | 4-16 |
| 17 | 5-5 |
| 18 | 6-1; 6-2 |
| 19 | 6-9; 6-14; 6-15 |
| 20 | 7-2 |
| 21 | 7-1; 7-5 |
| 22 | 7-10 |
| 23 | 7-15 |
| 24 | 8-1 |
| 25 | 7-18 |
| 26 | 8-9 |
| 27 | 8-5; 8-18 |
| 28 | 9-1; 9-2 |
| 29 | 9-3 |
| 30 | 10-1; 10-5 |
| 31 | 10-13 |

* Core Problems Most Closely Keyed to Diagnostic Questions.
The T.O. number circled was answered incorrectly on the diagnostic.

## STUDENT T.O. KEY SHEET

## SEGMENT NUMBER - CORE PROBLEM NUMBER

NAME ______________________ ACADEMY NUMBER ____________

| T.O. | SEGMENT NUMBER - CORE PROBLEM |
|---|---|
| 34 | 11-1 |
| 35 | 11-1 |
| 36 | 11-11; 11-15 |
| 37 | 11-18; 12-1 |
| 38 | 12-14 |
| 40 | 13-1; 13-4 |
| 41 | 13-1; 13-4 |
| 42 | 13-11 |
| 43 | 13-10 |
| 46 | 13-15; 13-19 |
| 47 | 13-6 |
| 48 | 13-1; 13-6 |

| ACADEMY PROBLEM NUMBER | SEGMENT NUMBER - CORE PROBLEM |
|---|---|
| 50 | 45-1 |
| 51 | 45-8 |
| 52 | 45-14 |
| 53 | 45-25 |

11/70

ANSWER KEY

1st Quarterly
Diagnostic Test

October, 1970

| T.O.# | Test Alpha | Test Beta | Test Gamma | Test Delta | Test Epsilon | Test Zeta |
|---|---|---|---|---|---|---|
| 1 | C | A | B | A | D | B |
| 2 | C | D | D | A | C | D |
| 3 | C | C | B | C | B | B |
| 4 | B | A | B | B | A | B |
| 5 | A | B | A | A | C | B |
| 6 | A | C | C | D | C | A |
| 7 | B | C | B | B | C | B |
| 8 | B | C | B | B | B | C |
| 9 | B | A | D | A | D | B |
| 10 | D | A | A | D | A | A |
| 11 | C | D | C | C | C | D |
| 12 | A | D | B | D | B | A |
| 13 | — | — | — | -- | -- | -- |
| 14 | B | A | A | B | A | A |
| 15 | B | C | D | D | B | C |
| 16 | D | B | B | B | B | D |
| 17 | C | B | A | C | B | A |
| 18 | B | C | A | A | B | C |
| 19 | B | C | B | C | B | B |
| 20 | C | B | D | B | C | D |
| 21 | A | B | D | D | A | C |
| 22 | D | C | D | C | D | D |
| 23 | B | D | D | D | D | B |
| 24 | C | B | A | A | C | B |
| 25 | A | A | B | A | B | B |
| 26 | D | C | C | D | C | C |
| 27 | D | A | C | A | C | D |
| 28 | C | B | C | D | B | A |
| 29 | D | B | D | D | C | B |
| 30 | C | B | D | C | B | D |

ANSWER KEY

SECOND QUARTERLY DIAGNOSTIC

NOVEMBER 1970

| T.O.# | TEST ETA | TEST THETA | TEST IOTA | TEST KAPPA | TEST LAMBDA | TEST MU |
|---|---|---|---|---|---|---|
| 34 | C | A | D | C | A | D |
| 35 | B | D | A | D | A | B |
| 36 | B | A | D | B | A | D |
| 37 | C | C | C | A | C | C |
| 38 | C | A | C | A | A | A |
| 40 | C | B | D | B | D | C |
| 41 | D | B | D | D | B | D |
| 42 | C | B | C | C | C | B |
| 43 | A | C | C | C | C | B |
| 46 | A | C | B | A | C | B |
| 47 | C | A | D | A | D | C |
| 48 | B | C | D | C | B | C |
| 50 | C | A | A | B | A | A |
| 51 | D | B | C | B | C | D |
| 52 | D | C | D | D | D | C |
| 53 | A | B | A | B | A | A |

## ANSWER KEY

## DIAGNOSTIC TESTS

## TEST NU

| TO # | ANSWER | TO # | ANSWER |
|---|---|---|---|
| 49 | A | 75 | A |
| 50 | C | 76 | B |
| 51 | A | 77 | D |
| 52 | C | 78 | B |
| 53 | B | 80 | B |
| 54 | B | 81 | B |
| 55 | A | 82 | A |
| 56 | B | 83 | C |
| 57 | C | 84 | B |
| 61 | B | 85 | C |
| 62 | A | 86 | B |
| 63 | B | 87 | B |
| 64 | D | 88 | B |
| 65 | B | 89 | A |
| 66 | B | 90 | A |
| 67 | B | 91 | A |
| 68 | A | 92 | C |
| 69 | C | 93 | B |
| 71 | B | 94 | A |
| 72 | B | 95 | C |
| 73 | C | 96 | A |
| 74 | D | 97 | B |

## TEST NU

(continued)

| TO # | ANSWER | TO # | ANSWER |
|---|---|---|---|
| 98 | A | 121 | A |
| 99 | A | 122 | B |
| 100 | A | 123 | D |
| 101 | D | 124 | C |
| 102 | D | 125 | B |
| 103 | C | 126 | B |
| 104 | A | | |
| 105 | B | | |
| 106 | D | | |
| 107 | A | | |
| 108 | A | | |
| 109 | C | | |
| 110 | C | | |
| 111 | C | | |
| 112 | B | | |
| 113 | A | | |
| 114 | B | | |
| 115 | B | | |
| 116 | A | | |
| 117 | B | | |
| 118 | A | | |
| 119 | A | | |
| 120 | C | | |

# ANSWER KEY

## DIAGNOSTIC TESTS

## TEST Xi

| TO # | ANSWER | TO # | ANSWER |
|---|---|---|---|
| 49 | D | 75 | D |
| 50 | D | 76 | C |
| 51 | C | 77 | C |
| 52 | A | 78 | A |
| 53 | B | 80 | D |
| 54 | C | 81 | C |
| 55 | A | 82 | D |
| 56 | C | 83 | A |
| 60 | D | 84 | C |
| 61 | A | 85 | B |
| 62 | A | 86 | A |
| 63 | B | 87 | D |
| 64 | C | 88 | B |
| 65 | A | 89 | C |
| 66 | D | 90 | C |
| 67 | C | 91 | B |
| 68 | C | 92 | D |
| 69 | C | 93 | D |
| 71 | C | 94 | B |
| 72 | B | 95 | C |
| 73 | C | 96 | A |
| 74 | D | 97 | B |

# ANSWER KEY

## DIAGNOSTIC TESTS

### TEST Xi (Cont.)

| TO # | ANSWER | TO # | ANSWER |
|---|---|---|---|
| 98 | C | 112 | C |
| 99 | D | 113 | B |
| 100 | D | 114 | B |
| 101 | C | 115 | A |
| 102 | D | 116 | A |
| 103 | B | 117 | B |
| 104 | A | 118 | B |
| 105 | B | 119 | C |
| 106 | B | 120 | C |
| 107 | B | 121 | B |
| 108 | C | 122 | B |
| 109 | B | 123 | D |
| 110 | B | 124 | B |
| 111 | D | 125 | A |
|  |  | 126 | C |

# ANSWER KEY

## DIAGNOSTIC TESTS

## TEST OMICRON

| TO # | ANSWER | TO# | ANSWER |
|---|---|---|---|
| 49 | C | 75 | C |
| 50 | A | 76 | C |
| 51 | D | 77 | B |
| 52 | B | 78 | C |
| 53 | C | 80 | C |
| 54 | B | 81 | B |
| 55 | C | 82 | B |
| 56 | B | 83 | A |
| 60 | B | 84 | D |
| 61 | B | 85 | C |
| 62 | C | 86 | A |
| 63 | D | 87 | D |
| 64 | C | 88 | D |
| 65 | D | 89 | D |
| 66 | D | 90 | C |
| 67 | B | 91 | B |
| 68 | B | 92 | C |
| 69 | A | 93 | A |
| 71 | B | 94 | B |
| 72 | A | 95 | A |
| 73 | D | 96 | C |
| 74 | A | 97 | C |

# ANSWER KEY

# DIAGNOSTIC TESTS

# TEST OMICRON

| TO # | ANSWER | TO # | ANSWER |
|---|---|---|---|
| 98 | D | 113 | C |
| 99 | B | 114 | B |
| 100 | B | 115 | A |
| 101 | A | 116 | A |
| 102 | C | 117 | C |
| 103 | A | 118 | B |
| 104 | B | 119 | D |
| 105 | B | 120 | D |
| 106 | D | 121 | C |
| 107 | D | 122 | A |
| 108 | C | 123 | C |
| 109 | C | 124 | C |
| 110 | C | 125 | D |
| 111 | D | 126 | B |
| 112 | C | | |

# ANSWER KEY

## DIAGNOSTIC TESTS

## TEST PI

| TO # | ANSWER | TO # | ANSWER |
|---|---|---|---|
| 49 | D | 75 | B |
| 50 | A | 76 | C |
| 51 | C | 77 | B |
| 52 | D | 78 | D |
| 53 | A | 80 | A |
| 54 | A | 81 | B |
| 55 | B | 82 | B |
| 56 | D | 83 | C |
| 60 | A | 84 | B |
| 61 | B | 85 | C |
| 62 | B | 86 | B |
| 63 | C | 87 | B |
| 64 | A | 88 | B |
| 65 | C | 89 | A |
| 66 | B | 90 | A |
| 67 | D | 91 | A |
| 68 | B | 92 | C |
| 69 | C | 93 | B |
| 71 | D | 94 | A |
| 72 | D | 95 | C |
| 73 | B | 96 | A |
| 74 | C | 97 | B |

# ANSWER KEY

## DIAGNOSTIC TESTS

## TEST PI

| TO # | ANSWER | TO # | ANSWER |
|---|---|---|---|
| 98 | D | 113 | B |
| 99 | A | 114 | C |
| 100 | A | 115 | C |
| 101 | C | 116 | C |
| 102 | B | 117 | B |
| 103 | C | 118 | B |
| 104 | D | 119 | C |
| 105 | C | 120 | A |
| 106 | C | 121 | C |
| 107 | D | 122 | D |
| 108 | D | 123 | D |
| 109 | C | 124 | C |
| 110 | A | 125 | B |
| 111 | C | 126 | D |
| 112 | B | | |

# ANSWER KEY

## DIAGNOSTIC TESTS

## TEST RHO

| TO # | ANSWER | TO # | ANSWER |
|---|---|---|---|
| 49 | A | 75 | C |
| 50 | A | 76 | C |
| 51 | D | 77 | B |
| 52 | C | 78 | C |
| 53 | D | 80 | C |
| 54 | B | 81 | B |
| 55 | C | 82 | A |
| 56 | A | 83 | B |
| 60 | B | 84 | C |
| 61 | C | 85 | B |
| 62 | C | 86 | A |
| 63 | D | 87 | D |
| 64 | C | 88 | B |
| 65 | A | 89 | C |
| 66 | D | 90 | C |
| 67 | B | 91 | B |
| 68 | C | 92 | D |
| 69 | A | 93 | D |
| 71 | B | 94 | B |
| 72 | A | 95 | C |
| 73 | A | 96 | A |
| 74 | A | 97 | B |

## ANSWER KEY

### TEST RHO
(continued)

| TO # | ANSWER | TO # | ANSWER |
|---|---|---|---|
| 98 | A | 112 | B |
| 99 | A | 113 | B |
| 100 | C | 114 | C |
| 101 | A | 115 | B |
| 102 | C | 116 | A |
| 103 | B | 117 | C |
| 104 | B | 118 | B |
| 105 | B | 119 | D |
| 106 | D | 120 | A |
| 107 | D | 121 | C |
| 108 | C | 122 | A |
| 109 | C | 123 | C |
| 110 | C | 124 | C |
| 111 | C | 125 | D |
|  |  | 126 | B |

T.O. 1 RR

A kilogram of mass weighs

(A) 9.8 lb

(B) 2.2 nt

(C) 2.2 lb

(D) 1 nt

T.O. 2 RR

In the equation

$$x - x_o = (1/2)\ at^2$$

for a particle moving with constant acceleration a,

(A) x is a relative position and $x_o$ is an absolute position

(B) t is an absolute time

(C) x and $x_o$ are absolute positions and t is a relative time

(D) x and $x_o$ are relative positions and t is an absolute time

T.O. 3 CU

Find the product of 5.070 and 1.1

(A) 5.5770

(B) 5.577

(C) 5.6

(D) 6

T.O. 4 CU

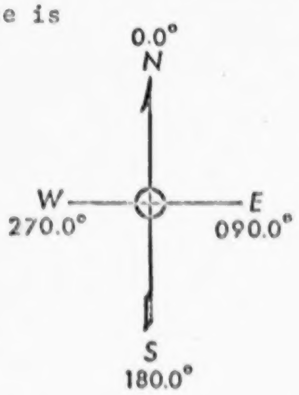
Two forces act simultaneously on the same point. Their values are 5.0 nt at 045.0° and 5.0 nt at 180.0°. The direction of the resultant force is

(A) Between $0^\circ$ and $90^\circ$

(B) Between $90^\circ$ and $180^\circ$

(C) Between $180^\circ$ and $270^\circ$

(D) Between $270^\circ$ and $360^\circ$



T.O. 5 CU

If an object is accelerated at the rate of

$$\alpha \text{ ft/sec}^2$$

what will be the increase in its speed during the tenth second of this acceleration?

(A) $\alpha$ ft/sec

(B) $\alpha$ $\text{ft/sec}^2$

(C) 10 $\alpha$ ft/sec

(D) 10 $\alpha$ $\text{ft/sec}^2$

T.O. 6 PS

A buoyant balloon is attached to a cup containing a marble. The balloon causes the cup to ascend at 15 ft/sec. At a height of 1 ft, a marble rolls out of a hole in the cup. The marble will strike the ground below in about

(A) 1 sec

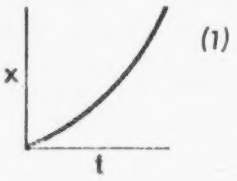
(B) 6 sec

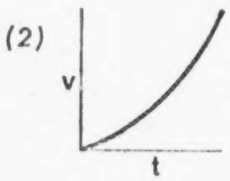
(C) $2\sqrt{5}$ sec

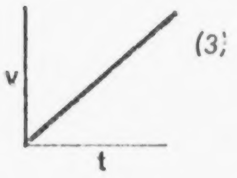
(D) 35 sec

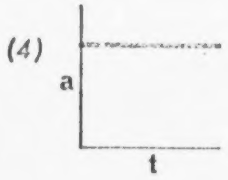
T.O. 7 CR

In which one of the following graphs can we be sure that the acceleration is varying?


(1)


(2)


(3)


(4)

(A) 1 (B) 2 (C) 3 (D) 4

T.O. 8 RR

From an analysis of the dimensions given, determine which choice would be an energy dimension.

(A) $\frac{\text{kg-m}}{\text{sec}}$

(B) $\frac{\text{kg-m}^2}{\text{sec}^2}$

(C) $\frac{\text{gm-cm}}{\text{sec}^2}$

(D) $\frac{\text{nt-m}}{\text{sec}}$

T.O. 9 CR

A boy throws a baseball straight up. It leaves his hand at a height of $y_o$ with an initial speed of $v_{oy}$ and rises to a height of y. The equation which may best be used to find the total time the ball takes to reach the ground is:

(A) $v_y = v_{oy} - gt$

(B) $y = y_o + v_{oy}t - \frac{1}{2} gt^2$

(C) $v_y{}^2 = v_{oy}{}^2 - 2g(y - y_o)$

(D) $y = y_o + \bar{v}_y t$

T.O. 10 PS/CR

A man walks toward the rear of a moving train while his motion is observed by a station attendant standing on a station platform. If the train moves to the right at 10 ft/sec relative to the stationery platform observer, while the walking man moves at 8 ft/sec to the right relative to the same station attendent; how fast does the man walk relative to the train?

(A) 18 ft/sec to the right

(B) 18 ft/sec to the left

(C) 2 ft/sec to the right

(D) 2 ft/sec to the left

T.O. 11 CR

The position of a particle may be expressed as

$$y = y_{ox} + a_x t$$

The acceleration of this particle is found by

(A) $a = \frac{dy}{dt}$

(B) $a = \int y \, dt$

(C) $a = \frac{d^2y}{dt^2}$

(D) $a = \iint y \, dt^2$

T.O. 12 CR

A stone is projected horizontally at a speed $v_o$ from the top of a building h meters high. For the information given, which expression may be used to find the downward velocity of the stone upon impact with the ground.

(A) $v_f^2 = v_o^2 + 2gs$

(B) $v_f = v_o + gt$

(C) $s = v_o t + \frac{1}{2} gt^2$

(D) None of the above since $v_o$ is in the horizontal direction.

T.O. 14 CR

How long does it take for a force F to change the speed of an object from $v_o$ to v if its mass is m?

A. $t = \frac{m(v_o - v)}{F}$

B. $t = \frac{m(v - v_o)}{F}$

C. $t = \frac{(v - v_o)}{Fm}$

D. $t = \frac{(v_o - v)}{Fm}$

T.O. 15 RR

As the altitude of a satellite above the Earth increases, its weight

(A) increases

(B) decreases

(C) remains the same

(D) is zero

T.O. 16 CU

An astronaut maintains his orbit in space because of the Earth's gravitational attraction and his inertia. If the inward gravitational attraction is the action force, the reaction is:

(A) his inertia

(B) zero, because he is "unattached" to the Earth

(C) equal to the gravitational force, but acting outward on him

(D) equal to the gravitational force, but acting on the Earth toward him

T.O. 17 RR

When a block slides down a plane at uniform speed, the coefficient of kinetic friction is equal to

(A) the sine of the angle of inclination.

(B) the cosine of the angle of inclination.

(C) the tangent of the angle of inclination.

(D) a more complex function of the angle.

T.O. 18 CR

The frequency of revolution, f, of an object moving uniformly with a speed v in a circular path of radius r can be expressed as:

(A) $2\pi r/v$

(B) $v/2\pi r$

(C) $4\pi^2 r^2/v$

(D) $v/4\pi^2 r^2$

T.O. 19 CU

When a centripetal force moves an object in a circular path at constant speed

A. The object undergoes a variable acceleration because its velocity varies

B. The object undergoes a constant acceleration because its velocity changes at a constant rate.

C. The object undergoes a variable acceleration because its direction varies

D. The object is not accelerated because its velocity remains constant

T.O. 20 CR

The work done by a constant force $\vec{F}$ in moving a mass m through a displacement $\vec{x}$, where the angle between $\vec{F}$ and $\vec{x}$ is always 90°, is

A. $+Fx$

B. $+\frac{1}{2} Fx^2$

C. Zero

D. $-Fx$

T.O. 21 RR

A force dependent upon displacement $F(x)$ acts on a body moving in the x-direction. If the body moves from $x_1$ to $x_2$, what is the total work of the force?

A. $\int_{x_1}^{x_2} F(x)dx$

B. $\int_{0}^{x_1} F(x)dx + \int_{x_1}^{x_2} F(x)dx$

C. $\int_{x_1}^{x_2} F(x)\ x\ dx$

D. $\int_{x_1}^{x_2} F(x)\ x^2\ dx$

T.O. 22 CR

A particle of mass M attached to a string is rotated in a horizontal circle of radius R. The period of the motion is T. What instantaneous power is supplied by the centripetal force F (the tension)?

A. $F(2\pi R)/T$

B. $FR/T$

C. $F/T$

D. Zero

T.O. 23 CR

A gun is fired horizontally imbedding a bullet of mass m a distance d into a block of wood. The frictional force acting on the bullet is f. The initial velocity of the bullet is

A. $2fd/m$

B. $(2fd/m)^{1/2}$

C. $fd/m$

D. $2fd/m^2$

T.O. 24 RR

If $W_c$ is the work done by all conservative forces acting on a body moving between points A and B, $W_{nc}$ is the work done by all nonconservative forces acting on the body, and $\Delta K$ is the change in kinetic energy of the body, then

(A) $W_c = \Delta K$

(B) $W_{nc} = \Delta K$

(C) $W_c + W_{nc} = \Delta K$

(D) $W_c + W_{nc} = 0$

T.O. 25 RR

The statement of the conservation of mechanical energy is

(A) $\Delta K + \Delta U = 0$

(B) $W_{nc} = \Delta K$

(C) $W_{nc} = \Delta K + \Delta U$

(D) $\Delta U = 0$

where $W_{nc}$ is the work done by nonconservative forces.

T.O. 26 RR

A spring of constant k compressed a distance x has potential energy equal to

(A) mgx

(B) mkx

(C) 1/2 kx

(D) $1/2\ kx^2$

T.O. 27 CU

The bob of a simple pendulum (mass m) is displaced from its equilibrium position such that the string (length R) holding the bob is horizontal. When the bob swings to the opposite side, how high above its equilibrium level does it go?

(A) R/3

(B) R/2

(C) 2R/3

(D) R

T.O. 28 CU

The center of mass of a straight drinking straw

(A) is the axis of the straw.

(B) is the entire outer surface of the straw.

(C) is the point on the axis of the straw equidistant from either end of the straw.

(D) is the ring of points around the center of the straw.

T.O. 29 CU

When a group of particles is in motion, the center of mass moves as though it was a particle with a mass equal to the sum of all the masses of the particles in the group. What is the force exerted on this fictitious particle?

(A) the average of all internal forces in the particles

(B) the sum of all internal forces in the particles

(C) the average of all external forces on the particles

(D) the sum of all external forces on the particles

T.O. 30 CR

Two bodies each of mass 3 kg are moving eastward; one with a velocity of 2 m/sec, the other with a velocity of 4 m/sec. The magnitude of the total momentum of the system is

(A) 6 kg-m/sec

(B) 12 kg-m/sec

(C) 18 kg-m/sec

(D) 60 kg-m/sec

T.O. 33 CU

The total mass of a system is 2 kg. The momentum of the system is changing at the rate of 6 kg-m/sec. What is the magnitude of the net external force exerted on the system?

(A) 3 nt

(B) 6 nt

(C) 12 nt

(D) 24 nt

T.O. 1 RR

A mile is approximately equivalent to:

(A) 1.6 km

(B) 0.6 km

(C) 0.45 km

(D) 2.54 km

T.O. 2 CU

Kinematic equations depend upon

(A) Absolute time and absolute positions.

(B) Absolute time and relative positions.

(C) Relative time and absolute positions.

(D) Relative times and relative positions.

T.O. 3 CU

Express the sum of the numbers 15, 140.001, and 0.57 .

(A) 155.571

(B) 155.57

(C) 156

(D) 160

T.O. 4 PS

Two forces act simultaneously on the same point on a body. Their values are 5.0 nt at a bearing of 045.0° and 3.0 nt at 180.0°. Find the magnitude of the resultant force.

(A) $\sqrt{13}$

(B) $\sqrt{34}$

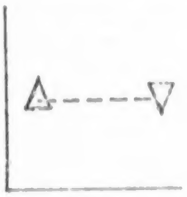
(C) $\sqrt{8}$

(D) 8

T.O. 5 CU

Of the following graphs of motion, which one(s) may be accomplished by translation alone?

(1)



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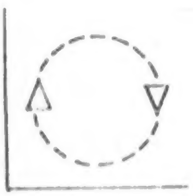

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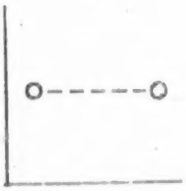

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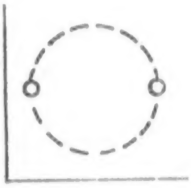


(A) 1,2 (B) 2,4 (C) 1,3 (D) 1,2,3,4

T.O. 6 PS

A group of science students wished to experiment with free fall motion. They threw a stone vertically down with an initial speed of 10 m/sec from the top of a 20 m building. What speed should they find the stone to have upon impact with the ground?

(A) 37 m/sec

(B) 34 m/sec

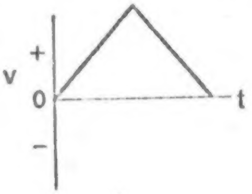
(C) 22 m/sec

(D) 20 m/sec

T.O. 7 CR

Which graph represents the motion of a ball from the time it is thrown vertically up till the time it is caught?

(1)



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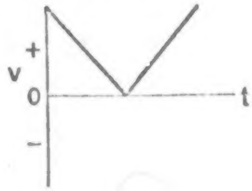

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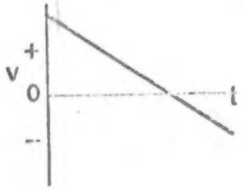
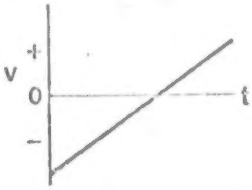
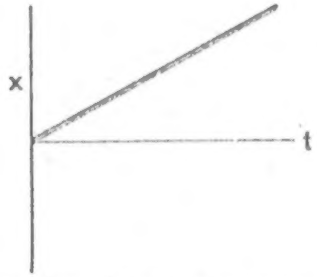


(4)



(A) 1 (B) 2 (C) 3 (D) 4

T.O. 8 CR/RR



The acceleration of the object whose motion is described by the graph must be:

(A) positive
(B) negative
(C) zero
(D) varying

T.O. 9 CR

To test for the gravitational acceleration, $g$, a ball is dropped from rest from a height $m$ and falls for the time $t$ to the ground. The gravitational acceleration, $g$, can be found by:

(A) $g = \frac{2m}{t^2}$

(B) $g = \frac{4m^2}{t^2}$

(C) $g = \frac{2m}{t}$

(D) Insufficient data. Must know impact velocity to solve.

T.O. 10 CR

A boy sets three toy cars in motion on the floor. Car A moves to the right 10 in/sec faster than car B. But Car B is moving to the left at 10 in/sec relative to car C. Select the equation below which will describe the velocity of car A relative to car C.

(A) $V_{AC}$ = 10 in/sec - 10 in/sec = 0

(B) $V_{AC}$ = 10 in/sec + 20 in/sec = 30 in/sec

(C) $V_{AC}$ = 10 in/sec - 20 in/sec = -10 in/sec

(D) $V_{AC}$ = 10 in/sec + 10 in/sec = 20 in/sec

T.O. 11 CR

The position of a particle is given by the equation

$$x = v_{ox}t + \frac{1}{2} a_x t^2$$

The velocity of this particle is

(A) $v_x = \sqrt{v_{ox} + 2a_x(x - x_o)}$

(B) $v_x = v_{ox}^2 + 2a_x(x - x_o)$

(C) $v_x = v_{ox} + 1/2a_x t^2$

(D) $v_x = v_{ox} + a_x t$

T.O. 12 CR

A baseball player hits a fly ball whose trajectory reaches a maximum height of h; the time the outfielder has to position himself for his catch can be found by:

(A) $\frac{2h}{g}$

(B) $\frac{4h}{g}$

(C) $\sqrt{\frac{2h}{g}}$

(D) $2\sqrt{\frac{2h}{g}}$

T.O. 14 CR

What force must be applied to an object of mass m to change its speed from $v_o$ to v in t seconds?

A. $F = m\left(\frac{v - v_o}{t}\right)$

B. $F = m\left(\frac{v_o - v}{t}\right)$

C. $F = \frac{(v - v_o)}{mt}$

D. $F = \frac{(v_o - v)}{mt}$

T.O. 15 RR

As the altitude of a satellite above the Earth increases, its mass

(A) increases

(B) decreases

(C) remains the same

(D) is zero

T.O. 16 CR

A man tries to push his stalled car on a level road. The maximum force he is able to apply is $\vec{F}$, but this is insufficient to move the car. The reaction to his force is a force of

(A) $\vec{F}$

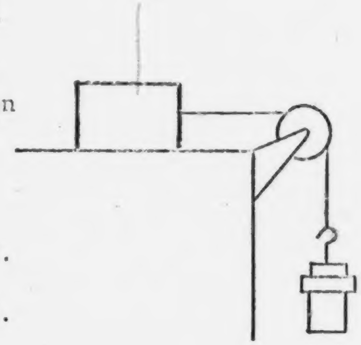
(B) $-\vec{F}$

(C) $2\vec{F}$

(D) zero, since the car does not move

T.O. 17 CU

In the situation shown in the diagram, a stationary block, is attached to suspended weights over a frictionless pulley. Additional weights are added very gently until the block begins to slide. The motion of the block will then be



(A) constant.

(B) accelerated.

(C) decelerated.

(D) May be any of the above choices.

T.O. 18 CR

What distance does an object which is revolving at f (constant) revolutions/sec cover each second?

(A) $\pi r^2 f$

(B) $\frac{f}{2\pi r}$

(C) $2\pi r f$

(D) $\frac{2\pi r}{f}$

T.O. 19 CU

A coin of mass m is placed on a stationary phono turntable at a distance r from the spindle. The switch is turned on and the turntable begins to accelerate. If the coefficients of friction are respectively $\mu_s$ and $\mu_k$ (static and kinetic) the magnitude of the centripetal force $F_c$ on the coin just before the coin starts to slide is

A. $F_c > \mu_s mg$

B. $F_c < \mu_s mg$

C. $F_c = \mu_s mg$

D. none of the above

T.O. 20 CR

The work done by a constant force $\vec{F}$ in moving a mass m through a displacement $\vec{x}$, where θ is the angle between $\vec{F}$ and $\vec{x}$, is

A. $W = Fmx$

B. $W = Fx \cos\theta$

C. $W = Fx \sin\theta$

D. $W = \frac{1}{2} Fx^2$

T.O. 21 CU

A force directly proportional to and acting in the direction of displacement is exerted on a body. The work of this force after displacing the body a distance x is

A. proportional to x

B. proportional to $x^2$

C. proportional to $x^3$

D. independent of x

T.O. 22 RR

The power P developed by a machine which does an amount of work W in time t is

A. $P = Wt$

B. $P = Wt^2$

C. $P = W/t$

D. $P = W/t^2$

T.O. 23 RR

The kinetic energy K of a body of mass m moving with an instantaneous velocity v and acceleration a is

(A) $K = ma$

(B) $K = mv2$

(C) $K = (1/3)mv3$

(D) $K = (1/2)mv^2$

D

T.O. 24 CU

Which of the following statements is *not* true.

A. A force is conservative if the work done by the force on a particle that moves through any round trip is zero.

B. A force is conservative if the work done by the force on a particle that moves between two points depends on the path taken between those points.

C. The force exerted on an object by a spring is conservative.

D. The gravitational force is conservative.

T.O. 25 RR

The statement of the conservation of mechanical energy is

(A) $\Delta K + \Delta U = 0$

(B) $W_{nc} = \Delta K$

(C) $W_{nc} = \Delta K + \Delta U$

(D) $\Delta U = 0$

where $W_{nc}$ is the work done by nonconservative forces.

T.O. 26 RR

The potential energy for an object of mass m a height h above the surface of the Earth is

(A) $1/2\ mh^2$

(B) $1/2\ mgh$

(C) $mgh$

(D) $2\ mgh$

C

T.O. 27 CR

The mass of a simple pendulum bob is m. It is displaced slightly from its equilibrium position such that the bob is a height h above its equilibrium level. It is now released from rest. Its velocity at the bottom of its swing can be computed from

(A) $mgh = 1/2\ mv^2$

(B) $gh = mv$

(C) $1/2\ gh^2 = 1/2\ mv^2$

(D) $gh = 2v^2$

T.O. 28 CR

A 10 gm particle approaches a stationary 50 gm particle with a speed of 5 cm/sec. The center of mass of the combined particles

(A) is closest to the 10 gm particle.

(B) is closest to the 50 gm particle.

(C) is in the center of the line joining the two particles.

(D) moves from a position closest to the moving particle to a position closest to the stationary particle.

T.O. 29 CU

Two objects attract each other, but are not under the influence of any other forces. Which of the following statements is true?

(A) the center of mass accelerates

(B) the center of mass may move at constant velocity

(C) the center of mass must be stationary

(D) a center of mass cannot be defined for interacting particles

T.O. 30 CR

A block moves horizontally with a velocity of 2 ft/sec. Its mass is 4 slugs. What is its momentum?

(A) 4 slug-ft/sec

(B) 8 slug-ft/sec

(C) 16 slug-ft/sec

(D) 32 slug-ft/sec

T.O. 33 CU

A ball strikes the floor, its initial velocity making an angle θ with the normal. It rebounds with the same speed also at an angle θ with normal. (The total angular change in direction of the ball is 180° - 2θ) What is the direction of the average impulsive force exerted on the ball by the floor?

(A) vertically upward

(B) vertically downward

(C) at an angle θ upward

(D) horizontally along the floor

T.O. 1 RR

The English system of measurement uses the slug as a unit of mass. This term is equivalent to a

(A) $\frac{ft\text{-}lb}{sec^2}$

(B) $\frac{lb\text{-}sec^2}{ft}$

(C) $\frac{ft\text{-}sec^2}{lb}$

(D) $\frac{lb}{ft\text{-}sec^2}$

T.O. 2 RR

In the equation for constant velocity

$$v = \frac{(x - x_o)}{t}$$

(A) $x$ is a relative position and $x_o$ is an absolute position.

(B) $t$ is an absolute time.

(C) $x$ and $x_o$ are relative positions and $t$ is an absolute time.

(D) $x$ and $x_o$ are absolute positions and $t$ is a relative time.

T.O. 3 CU

Select, from the choices below, the pair of numbers having the same number of significant digits.

(A) 0.05030, 0.0503

(B) 0.05030, 12.00

(C) 503, 1200

(D) 0.503, 1200

T.O. 4 RR

Which one of the choices is a meaningless vector operation?

(A) $\vec{A} \cdot (\vec{B} \times \vec{C})$

(B) $(\vec{A} \cdot \vec{B}) \times \vec{C}$

(C) $A \times B \times C$

(D) $k(A \times B)$

T.O. 5 RR/CU

The center of mass of a hollow sphere

(A) is located at the geometric center even though no mass is present at that location.

(B) is distributed throughout the mass since it cannot be located in empty space.

(C) does not exist at all for a sphere without mass at its center.

(D) forms its own spherical surface which touches everywhere the inside surface of the hollow sphere.

T.O. 6 CR

In the following problem: "A ball is thrown vertically upward with an initial speed $v_o$. After 3.00 sec its speed has decreased from $v_o$ to 25.0 m/sec but it is still ascending. Calculate $v_o$." Which statement will lead to the right answer?

A. $v_o = 25 - (9.8 \times 3.00)$

B. $v_o = 9.8 \times 3.00) - 25$

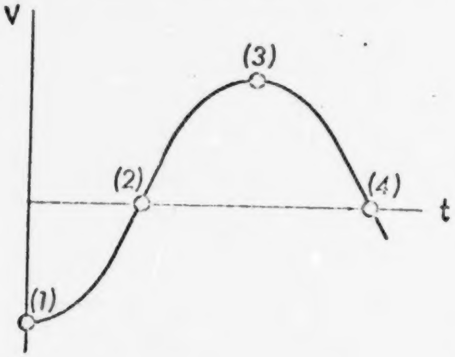
C. $v_o = 25 + (9.8 \times 3.00)$

D. $v_o = 25 + (9.8/3.00)$

T.O 7

CR/RR

Select from the labeled points in the graph those which represent zero acceleration.



(A) 2,4 (B) 1, 3 (C) 1,2,3,4 (D) None of the points labeled.

T.O. 8

CU

In the equation

$$\alpha = v_o + \frac{1}{2} a(2t - 1 \text{ sec})$$

a = acceleration and t = time. From analysis of the dimensions, α is the equation of

(A) position

(B) speed

(C) acceleration

(D) has no meaning since it is dimensionally inconsistent

T.O. 9

CR

To find the height of a telphone pole, a student threw a ball striaght up to the height of the pole, and found the time t to rise and fall back to his hands. The height of the pole above his hands can now be found by

(A) $gt^2$

(B) $\frac{1}{2} gt^2$

(C) $\frac{1}{4} gt^2$

(D) $\frac{1}{8} gt^2$

T.O. 10 CR

Three billiard balls are set in motion on a pool table. The velocity of ball A relative to ball C is $\vec{V}_{AC}$. The velocity of ball B relative to ball C is $\vec{V}_{BC}$. What is the velocity of ball A relative to ball B ?

(A) $\vec{V}_{AB} = \vec{V}_{AC} - \vec{V}_{BC}$

(B) $\vec{V}_{AB} = \vec{V}_{BC} - \vec{V}_{AC}$

(C) $\vec{V}_{AB} = \vec{V}_{AC} + \vec{V}_{BC}$

(D) $\vec{V}_{AB} = 0$

T.O. 11 CU

The instantaneous velocity may be determined from $v = at$ only for

(A) variable acceleration

(B) variable velocity

(C) constant acceleration

(D) constant velocity

T.O. 12 RR

A ship's gun can project a shell with a muzzle velocity of 980 m/sec. What is the angle of elevation above the horizontal for the maximum range of this gun.

(A) $30^\circ$

(B) $45^\circ$

(C) $60^\circ$

(D) $90^\circ$

T.O. 14

CR

Knowing the initial velocity of a body of mass m to be $v_o$, its final velocity, v, and the distance covered during this acceleration is s, what equation yields the force causing the acceleration?

A. $\frac{m(v - v_o)}{2s}$

B. $\frac{(v - v_o)}{2ms}$

C. $\frac{m(v - v_o)}{2t}$

D. $\frac{(v - v_o)}{mt}$

T.O. 15

CR

The weight of an astronaut (mass m) in orbit at an altitude above the Earth (mass M) equal to the Earth's radius, R, can be found from

A. $W = GMmR^2$

B. $W = 4GMmR^2$

C. $W = G\frac{Mm}{R^2}$

D. $W = G\frac{Mm}{4R^2}$

T.O. 16 CU

If you release an inflated balloon, without tying off the opening, the balloon flys in a direction always away from the escaping gas. This occurs because the escaping gas

(A) pushes on the air outside causing a reaction in the opposite direction.

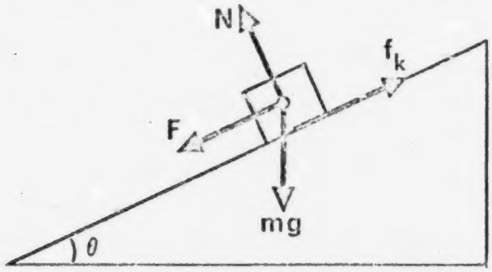
(B) pushes in all directions inside the balloon including forward while it escapes to the rear.

(C) forms a high pressure region behind the balloon.

(D) expands outside forming a low pressure region behind the balloon.

T.O. 17 CR

In the situation shown in the diagram, the force of kinetic friction is given by



*BLOCK SLIDING DOWN WITH CONSTANT ACCELERATION*

A. $\mu_k$ mg $\cos\theta$

B. $\mu_k$ N $\cos\theta$

C. $\mu_k$ F $\sin\theta$

D. $\mu_k$ F $\cos\theta$

T.O. 18 CR

The period of each revolution, $\tau$, of an object moving uniformly with a speed v in a circular path of radius r can be expressed as:

(A) $2\pi r/v$

(B) $v/2\pi r$

(C) $4\pi^2 r^2/v$

(D) $v/4\pi^2 r^2$

T.O. 19 CU

A centripetal force produces a centripetal acceleration

A. outward along the radius

B. inward along the radius

C. along a tangent to the curve, forward

D. along a tangent to the curve to the rear

T.O. 20 CU

The work done by a constant force $\vec{F}$ in moving a mass m through a displacement $\vec{x}$, where the angle between $\vec{F}$ and $\vec{x}$ is always 180°, is

A. $\vec{F} \times \vec{x}$

B. $+Fx$

C. Zero

D. $-Fx$

T.O. 21 CU

A woman begins to lift a pail of water out of a well; the initial total weight is W. The pail has a leak, however, and as the pail is lifted a distance y, water is slowly lost. The work of the woman is

A. $Wy$

B. $\frac{1}{2} Wy$

C. $\frac{1}{2} Wy^2$

D. unable to be determined from the information given

T.O. 22 RR

A constant force F moves a body in the y-direction a distance $y_o$. The average velocity of the body during this motion is $\overline{v}$. What is the average power $\overline{P}$ delivered by the force?

A. $Fy_o$

B. $Fy_o\overline{v}$

C. $F/y_o$

D. $F\overline{v}$

T.O. 23 CU

When using the work-energy theorem to solve problems, one must always

A. omit the work done by the friction forces

B. omit the work done by non-conservative forces

C. include only the work done by non-conservative forces

D. include the work done by all forces

T.O. 24 CU

Which of the following forces is *not* conservative?

(A) the frictional force

(B) the gravitational force

(C) the force exerted by an ideal spring

(D) the force exerted on a charge in an electric field

A

T.O. 25 RR

The principle of the conservation of energy may be written as

(A) Energy may be created or destroyed and transformed from one kind to another.

(B) Energy may be transformed from one kind to another, but it cannot be created or destroyed.

(C) Energy may be created and transformed from one kind to another, but it cannot be destroyed.

(D) Energy may be created or destroyed, but not transformed from one kind to another.

T.O. 26 CR

A mass m hanging from a spring of constant k is raised vertically compressing the spring a distance x. It is then released. The velocity of the mass as it passes its starting point may be calculated using the relation

(A) $mgx + mkx = mv^2$

(B) $mgx + 1/2\ mk^2 = 1/2\ mv^2$

(C) $mgx + 1/2\ kx^2 = 1/2\ mv^2$

(D) $mkx + mk^2 = mv^2$

T.O. 27 CU

As the bob of a simple pendulum swings to and fro, its energy is

(A) only kinetic

(B) only potential

(C) a combination of kinetic and potential

(D) simple harmonic

T.O. 28 CR

Two point masses m and M are located on a line at positions $x_1$ and $x_2$, respectively. The center of mass of this system is located on this line at a position given by the expression

(A) $(m + M)/2$

(B) $(Mx_2 - mx_1)/(m + M)$

(C) $(mx_2 + mx_1)/(m + M)$

(D) $M(x_1 + x_2)/(m + M)$

T.O. 29 CU

When a group of particles is subjected to external forces, the center of mass moves as though it was a particle subjected to the sum of all the external forces. The mass of this fictitious particle is

(A) the average mass of the group of particles.

(B) the mass of the heaviest particle in the group.

(C) the mass of the lightest particle in the group.

(D) the sum of the masses of the particles in the group.

T.O. 30 CR

An object of mass 2 kg moves to the right with a velocity of 4 m/sec; another object of mass 4 kg moves to the left with a velocity of 2 m/sec. What is the total momentum of the system?

(A) 16 kg-m/sec

(B) 8 kg-m/sec

(C) 4 kg-m/sec

(D) 0

T.O. 33 CR

A ball of mass m grams strikes a wall horizontally with a velocity of v cm/sec. Its velocity after rebounding from the wall is also-v cm/sec. What is the average impulsive force exerted by the wall if the ball was in contact with the wall for t sec?

(A) zero

(B) mv dynes

(C) mv/t dynes

(D) 2 mv/t dynes

T.O. 1 RR

A mile is approximately equivalent to:

(A) 1.6 km

(B) 0.6 km

(C) 0.45 km

(D) 2.54 km

T.O. 2 RR or CU

In the equation for constant velocity

$$v = \frac{(x - x_o)}{t}$$

(A) x and $x_o$ depend upon the frame of reference and t does not depend upon the frame of reference

(B) x and $x_o$ do not depend upon the frame of reference and t does depend upon the frame of reference

(C) x, $x_o$, and t depend upon the frame of reference

(D) x, $x_o$, and t do not depend upon the frame of reference

T.O. 3 CU

Express the sum of the numbers 15, 140.001, and 0.57 .

(A) 155.571

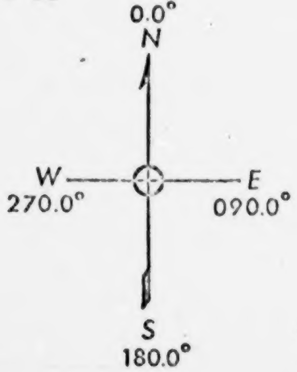
(B) 155.57

(C) 156

(D) 160

T.O. 4 CU

Two forces act simultaneously on the same point. Their values are 5.0 nt at 045.0° and 5.0 nt at 180.0°. The direction of the resultant force is



(A) Between 0° and 90°

(B) Between 90° and 180°

(C) Between 180° and 270°

(D) Between 270° and 360°

T.O. 5 RR/CU

The center of mass of a hollow sphere

(A) is located at the geometric center even though no mass is present at that location.

(B) is distributed throughout the mass since it cannot be located in empty space.

(C) does not exist at all for a sphere without mass at its center.

(D) forms its own spherical surface which touches everywhere the inside surface of the hollow sphere.

T.O. 6 PS

A boy throws a baseball vertically upward. If the ball is caught 4.0 seconds later, what height did it attain?

(A) 264 m

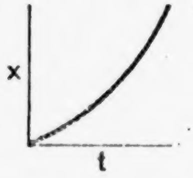
(B) 78 m

(C) 64 m

(D) 19.6 m

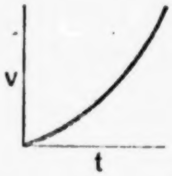
T.O. 7 CR

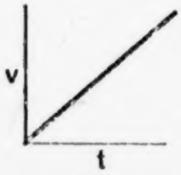
In which one of the following graphs can we be sure that the acceleration is varying?



(1)

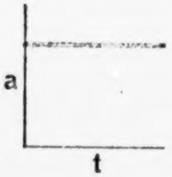
(2)





(3)

(4)



(A) 1 (B) 2 (C) 3 (D) 4

T.O. 8 CU

In the equation

$$\alpha = v_o + \frac{1}{2} a(2t - 1 \text{ sec})$$

a = acceleration and t = time. From analysis of the dimensions, $\alpha$ is the equation of

(A) position

(B) speed

(C) acceleration

(D) has no meaning since it is dimensionally inconsistent

T.O. 9 CR

To test for the gravitational acceleration, g, a ball is dropped from rest from a height m and falls for the time t to the ground. The gravitational acceleration, g, can be found by:

(A) $g = \frac{2m}{t^2}$

(B) $g = \frac{4m^2}{t^2}$

(C) $g = \frac{2m}{t}$

(D) Insufficient data. Must know impact velocity to solve.

T.O. 10 PS/CR

A man walks toward the rear of a moving train while his motion is observed by a station attendant standing on a station platform. If the train moves to the right at 10 ft/sec relative to the stationery platform observer, while the walking man moves at 8 ft/sec to the right relative to the same station attendent; how fast does the man walk relative to the train?

(A) 18 ft/sec to the right

(B) 18 ft/sec to the left

(C) 2 ft/sec to the right

(D) 2 ft/sec to the left

T.O. 11 CU

The instantaneous velocity may be determined from $v = at$ only for

(A) variable acceleration

(B) variable velocity

(C) constant acceleration

(D) constant velocity

T.O. 12 CR

A baseball player hits a fly ball whose trajectory reaches a maximum height of $h$; the time the outfielder has to position himself for his catch can be found by:

(A) $\frac{2h}{g}$

(B) $\frac{4h}{g}$

(C) $\sqrt{\frac{2h}{g}}$

(D) $2\sqrt{\frac{2h}{g}}$

T.O. 14 CR

How long does it take for a force F to change the speed of an object from $v_o$ to v if its mass is m?

A. $t = \frac{m(v_o - v)}{F}$

B. $t = \frac{m(v - v_o)}{F}$

C. $t = \frac{(v - v_o)}{Fm}$

D. $t = \frac{(v_o - v)}{Fm}$

T.O. 15 CR

The weight of an astronaut (mass m) in orbit at an altitude above the Earth (mass M) equal to the Earth's radius, R, can be found from

A. $W = GMmR^2$

B. $W = 4GMmR^2$

C. $W = G\frac{Mm}{R^2}$

D. $W = G\frac{Mm}{4R^2}$

T.O. 16 CR

A man tries to push his stalled car on a level road. The maximum force he is able to apply is $\vec{F}$, but this is insufficient to move the car. The reaction to his force is a force of

(A) $\vec{F}$

(B) $-\vec{F}$

(C) $2\vec{F}$

(D) zero, since the car does not move

T.O. 17 RR

When a block slides down a plane at uniform speed, the coefficient of kinetic friction is equal to

(A) the sine of the angle of inclination.

(B) the cosine of the angle of inclination.

(C) the tangent of the angle of inclination

(D) a more complex function of the angle.

T.O. 18 CR

The period of each revolution, $\tau$, of an object moving uniformly with a speed v in a circular path of radius r can be expressed as:

(A) $2\pi r/v$

(B) $v/2\pi r$

(C) $4\pi^2 r^2/v$

(D) $v/4\pi^2 r^2$

T.O. 19 CU

A coin of mass m is placed on a stationary phono turntable at a distance r from the spindle. The switch is turned on and the turntable begins to accelerate. If the coefficients of friction are respectively $\mu_s$ and $\mu_k$ (static and kinetic) the magnitude of the centripetal force $F_c$ on the coin just before the coin starts to slide is

A. $F_c > \mu_s mg$

B. $F_c < \mu_s mg$

C. $F_c = \mu_s mg$

D. none of the above

T.O. 20 CR

A force stretches a spring with a spring constant k an amount x from its equilibrium position (the force and x are in the same direction). The work done by this force is

A. $+kx$

B. $+ 1/2\ kx^2$

C. $- 1/2\ kx^2$

D. $+ 1/2\ kx$

T.O. 21 CU

A woman begins to lift a pail of water out of a well; the initial total weight is W. The pail has a leak, however, and as the pail is lifted a distance y, water is slowly lost. The work of the woman is

A. $Wy$

B. $\frac{1}{2} Wy$

C. $\frac{1}{2} Wy^2$

D. unable to be determined from the information given

T.O. 22 RR

The power P developed by a machine which does an amount of work W in time t is

A. $P = Wt$

B. $P = Wt^2$

C. $P = W/t$

D. $P = W/t^2$

T.O. 23 RR

Which of the following statements is *not* true?

(A) One-half of the product of the mass of a body and the square of its speed is called the kinetic energy of the body.

(B) The work done by the resultant force acting on a body is equal to the change in the kinetic energy of the body.

(C) The kinetic energy of a body in motion is equal to the work it can do in being brought to rest.

(D) The kinetic energy is a function of position whose negative derivative gives the force.

T.O. 24 CU

Which of the following forces is *not* conservative?

(A) the frictional force

(B) the gravitational force

(C) the force exerted by an ideal spring

(D) the force exerted on a charge in an electric field

T.O. 25 RR

The statement of the conservation of mechanical energy is

(A) $\Delta K + \Delta U = 0$

(B) $W_{nc} = \Delta K$

(C) $W_{nc} = \Delta K + \Delta U$

(D) $\Delta U = 0$

where $W_{nc}$ is the work done by nonconservative forces.

T.O. 26 RR

A spring of constant k compressed a distance x has potential energy equal to

(A) mgx

(B) mkx

(C) 1/2 kx

(D) $1/2\ kx^2$

T.O. 27 CR

The mass of a simple pendulum bob is m. It is displaced slightly from its equilibrium position such that the bob is a height h above its equilibrium level. It is now released from rest. Its velocity at the bottom of its swing can be computed from

(A) $mgh = 1/2\ mv^2$

(B) gh = mv

(C) $1/2\ gh^2 = 1/2\ mv^2$

(D) $gh = 2v^2$

T.O. 28 CU

Which of the following is a correct statement regarding the center of mass of a circular ring?

(A) It is the entire outer surface of the ring.

(B) It cannot be the geometrical center of the ring because there is no material at this point.

(C) It may be exterior to the ring, depending upon the mass distribution of the ring.

(D) It is the geometrical center of the ring when the mass distribution is symmetrical around the center.

T.O. 29 CU

Two particles move toward each other. The center of mass of this system .

(A) remains equidistant from each particle.

(B) becomes closer to the heavier particle and further from the lighter particle.

(C) becomes closer to the lighter particle and further from the heavier particle.

(D) becomes closer to both particles.

T.O. 30 CR

Two bodies each of mass 3 kg are moving eastward; one with a velocity of 2 m/sec, the other with a velocity of 4 m/sec. The magnitude of the total momentum of the system is

(A) 6 kg-m/sec

(B) 12 kg-m/sec

(C) 18 kg-m/sec

(D) 60 kg-m/sec

---

T.O. 33 CU

A ball strikes the floor, its initial velocity making an angle $\theta$ with the normal. It rebounds with the same speed also at an angle $\theta$ with normal. (The total angular change in direction of the ball is $180° - 2\theta$) What is the direction of the average impulsive force exerted on the ball by the floor?

(A) vertically upward

(B) vertically downward

(C) at an angle $\theta$ upward

(D) horizontally along the floor

T.O. 1 RR

In the MKS system of measurements, the unit of energy is the joule. This term is equivalent to a

(A) $\frac{kg\text{-}m}{sec}$

(B) $\frac{kg\text{-}m}{sec^2}$

(C) $\frac{kg\text{-}m^2}{sec}$

(D) $\frac{kg\text{-}m^2}{sec^2}$

T.O. 2 RR

In the equation

$$x - x_o = (1/2)\ at^2$$

for a particle moving with constant acceleration a,

(A) x is a relative position and $x_o$ is an absolute position

(B) t is an absolute time

(C) x and $x_o$ are absolute positions and t is a relative time

(D) x and $x_o$ are relative positions and t is an absolute time

T.O. 3 CU

Select, from the choices below, the pair of numbers having the same number of significant digits.

(A) 0.05030, 0.0503

(B) 0.05030, 12.00

(C) 503, 1200

(D) 0.503, 1200

T.O. 4 PS

Two forces act simultaneously on the same point on a body. Their values are 5.0 nt at a bearing of 045.0° and 3.0 nt at 180.0°. Find the magnitude of the resultant force.

(A) $\sqrt{13}$

(B) $\sqrt{34}$

(C) $\sqrt{8}$

(D) 8

T.O. 5 RR

The study of the motion of an object is termed

(A) mechanics

(B) dynamics

(C) kinematics

(D) Newton's first law of motion

T.O. 6 CR

In the following problem: "A ball is thrown vertically upward with an initial speed $v_o$. After 3.00 sec its speed has decreased from $v_o$ to 25.0 m/sec but it is still ascending. Calculate $v_o$." Which statement will lead to the right answer?

A. $v_o = 25 - (9.8 \times 3.00)$

B. $v_o = 9.8 \times 3.00) - 25$

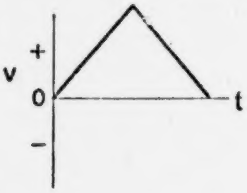
C. $v_o = 25 + (9.8 \times 3.00)$

D. $v_o = 25 + (9.8/3.00)$

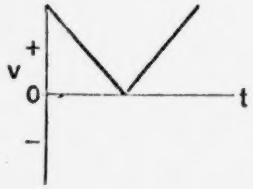
T.O. 7 CR

Which graph represents the motion of a ball from the time it is thrown vertically up till the time it is caught?

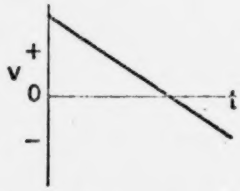
(1)



(2)



(3)



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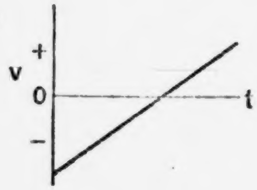


(A) 1 (B) 2 (C) 3 (D) 4

T.O. 8 RR

From an analysis of the dimensions given, determine which choice would be an energy dimension.

(A) $\frac{\text{kg-m}}{\text{sec}}$

(B) $\frac{\text{kg-m}^2}{\text{sec}^2}$

(C) $\frac{\text{gm-cm}}{\text{sec}^2}$

(D) $\frac{\text{nt-m}}{\text{sec}}$

T.O. 9 CR

To find the height of a telphone pole, a student threw a ball striaght up to the height of the pole, and found the time t to rise and fall back to his hands. The height of the pole above his hands can now be found by

(A) $gt^2$

(B) $\frac{1}{2} gt^2$

(C) $\frac{1}{4} gt^2$

(D) $\frac{1}{8} gt^2$

T.O. 10 CR

A boy sets three toy cars in motion on the floor. Car A moves to the right 10 in/sec faster than car B. But Car B is moving to the left at 10 in/sec relative to car C. Select the equation below which will describe the velocity of car A relative to car C.

(A) $V_{AC} = 10 \text{ in/sec} - 10 \text{ in/sec} = 0$

(B) $V_{AC} = 10 \text{ in/sec} + 20 \text{ in/sec} = 30 \text{ in/sec}$

(C) $V_{AC} = 10 \text{ in/sec} - 20 \text{ in/sec} = -10 \text{ in/sec}$

(D) $V_{AC} = 10 \text{ in/sec} + 10 \text{ in/sec} = 20 \text{ in/sec}$

T.O. 11 CR

The position of a particle may be expressed as

$$y = y_{ox} + a_x t$$

The acceleration of this particle is found by

(A) $a = \frac{dy}{dt}$

(B) $a = \int y \, dt$

(C) $a = \frac{d^2y}{dt^2}$

(D) $a = \iint y \, dt^2$

T.O. 12 RR

A ship's gun can project a shell with a muzzle velocity of 980 m/sec. What is the angle of elevation above the horizontal for the maximum range of this gun.

(A) 30°

(B) 45°

(C) 60°

(D) 90°

T.O. 14 CR

What force must be applied to an object of mass m to change its speed from $v_o$ to v in t seconds?

A. $F = m\left(\frac{v - v_o}{t}\right)$

B. $F = m\left(\frac{v_o - v}{t}\right)$

C. $F = \frac{(v - v_o)}{mt}$

D. $F = \frac{(v_o - v)}{mt}$

T.O. 15 RR

As the altitude of a satellite above the Earth increases, its weight

(A) increases

(B) decreases

(C) remains the same

(D) is zero

T.O. 16 CU

If you release an inflated balloon, without tying off the opening, the balloon flys in a direction always away from the escaping gas. This occurs because the escaping gas

(A) pushes on the air outside causing a reaction in the opposite direction.

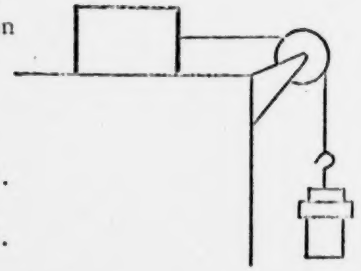
(B) pushes in all directions inside the balloon including forward while it escapes to the rear.

(C) forms a high pressure region behind the balloon.

(D) expands outside forming a low pressure region behind the balloon.

T.O. 17 CU

In the situation shown in the diagram, a stationary block, is attached to suspended weights over a frictionless pulley. Additional weights are added very gently until the block begins to slide. The motion of the block will then be



(A) constant.

(B) accelerated.

(C) decelerated.

(D) May be any of the above choices.

T.O. 18 CR

The frequency of revolution, f, of an object moving uniformly with a speed v in a circular path of radius r can be expressed as:

(A) $2\pi r/v$

(B) $v/2\pi r$

(C) $4\pi^2r^2/v$

(D) $v/4\pi^2r^2$

T.O. 19 CU

A centripetal force produces a centripetal acceleration

A. outward along the radius

B. inward along the radius

C. along a tangent to the curve, forward

D. along a tangent to the curve to the rear

T.O. 20 CU

A constant force acting on a body moving through a displacement will

A. always do positive work

B. always do negative work

C. sometimes do no work

D. only do work when the body is accelerated

---

T.O. 21 RR

A force dependent upon displacement F(x) acts on a body moving in the x-direction. If the body moves from $x_1$ to $x_2$, what is the total work of the force?

A. $\int_{x_1}^{x_2} F(x)dx$

B. $\int_{0}^{x_1} F(x)dx + \int_{x_1}^{x_2} F(x)dx$

C. $\int_{x_1}^{x_2} F(x)\ x\ dx$

D. $\int_{x_1}^{x_2} F(x)\ x^2\ dx$

---

T.O. 22 RR

A constant force F moves a body in the y-direction a distance $y_o$. The average velocity of the body during this motion is $\overline{v}$. What is the average power $\overline{P}$ delivered by the force?

A. $Fy_o$

B. $Fy_o\overline{v}$

C. $F/y_o$

D. $F\overline{v}$

T.O. 23 CR

A falling object of mass m compresses a spring of constant k a distance y and comes to rest momentarily. Which of the following expressions could be used to calculate the velocity v of the object when it initially contacted the spring?

A. $mg - ky = mv$

B. $mgy = \frac{1}{2} mv^2$

C. $mgy = ky^2/2$

D. $mgy - ky^2/2 = -mv^2/2$

T.O. 24 RR

If $W_c$ is the work done by all conservative forces acting on a body moving between points A and B, $W_{nc}$ is the work done by all nonconservative forces acting on the body, and $\Delta K$ is the change in kinetic energy of the body, then

(A) $W_c = \Delta K$

(B) $W_{nc} = \Delta K$

(C) $W_c + W_{nc} = \Delta K$

(D) $W_c + W_{nc} = 0$

T.O. 25 RR

The principle of the conservation of energy may be written as

(A) Energy may be created or destroyed and transformed from one kind to another.

(B) Energy may be transformed from one kind to another, but it cannot be created or destroyed.

(C) Energy may be created and transformed from one kind to another, but it cannot be destroyed

(D) Energy may be created or destroyed, but not transformed from one kind to another.

T.O. 26

CR

A mass m hanging from a spring of constant k is raised vertically compressing the spring a distance x. It is then released. The velocity of the mass as it passes its starting point may be calculated using the relation

(A) $mgx + mkx = mv^2$

(B) $mgx + 1/2\ mk^2 = 1/2\ mv^2$

(C) $mgx + 1/2\ kx^2 = 1/2\ mv^2$

(D) $mkx + mk^2 = mv^2$

T.O. 27

CU

As the bob of a simple pendulum swings to and fro, its energy is

(A) only kinetic

(B) only potential

(C) a combination of kinetic and potential

(D) simple harmonic

T.O. 28

CR

A 10 gm particle approaches a stationary 50 gm particle with a speed of 5 cm/sec. The center of mass of the combined particles

(A) is closest to the 10 gm particle.

(B) is closest to the 50 gm particle.

(C) is in the center of the line joining the two particles.

(D) moves from a position closest to the moving particle to a position closest to the stationary particle.

T.O. 29 CU

Two objects which attract each other are released from rest. The objects are not influenced by forces other then their mutual interaction. Which of the following statements is true?

(A) The center of mass accelerates.

(B) The center of mass moves at constant velocity.

(C) The center of mass must be stationary.

(D) A center of mass cannot be defined for interacting particles.

T.O. 30 CR

A block moves horizontally with a velocity of 2 ft/sec. Its mass is 4 slugs. What is its momentum?

(A) 4 slug-ft/sec

(B) 8 slug-ft/sec

(C) 16 slug-ft/sec

(D) 32 slug-ft/sec

T.O. 33 CU

The total mass of a system is 2 kg. The momentum of the system is changing at the rate of 6 kg-m/sec. What is the magnitude of the net external force exerted on the system?

(A) 3 nt

(B) 6 nt

(C) 12 nt

(D) 24 nt

T.O. 1 RR

The English system of measurement uses the slug as a unit of mass. This term is equivalent to a

(A) $\frac{\text{ft-lb}}{\text{sec}^2}$

(B) $\frac{\text{lb-sec}^2}{\text{ft}}$

(C) $\frac{\text{ft-sec}^2}{\text{lb}}$

(D) $\frac{\text{lb}}{\text{ft-sec}^2}$

T.O. 2 CU

Kinematic equations depend upon

(A) Absolute time and absolute positions.

(B) Absolute time and relative positions.

(C) Relative time and absolute positions.

(D) Relative times and relative positions.

T.O. 3 CU

Measurements taken of the three sides of a triangle were found to be: 14.16 cm, 7.321 cm, and 9.8 cm. Using this data, what is the most accurate expression of the triangle's perimeter?

(A) 31 cm

(B) 31.3 cm

(C) 31.28 cm

(D) 31.281 cm

T.O. 4 RR

Which one of the choices is a meaningless vector operation?

(A) $\vec{A} \cdot (\vec{B} \times \vec{C})$

(B) $(\vec{A} \cdot \vec{B}) \times \vec{C}$

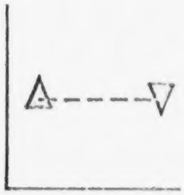
(C) $A \times B \times C$

(D) $k(A \times B)$

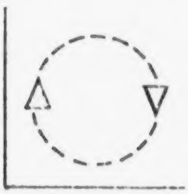
T.O. 5 CU

Of the following graphs of motion, which one(s) may be accomplished by translation alone?

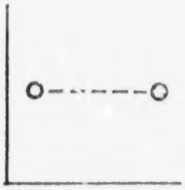
(1)



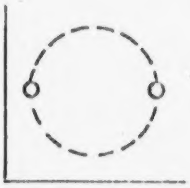
(3)



(2)



(4)



(A) 1,2 (B) 2,4 (C) 1,3 (D) 1,2,3,4

T.O. 6 PS

A buoyant balloon is attached to a cup containing a marble. The balloon causes the cup to ascend at 15 [illegible]/sec. At a height of [illegible], a marble rolls out of a hole in the cup. The marble will strike the ground below in about

(A) 1 sec

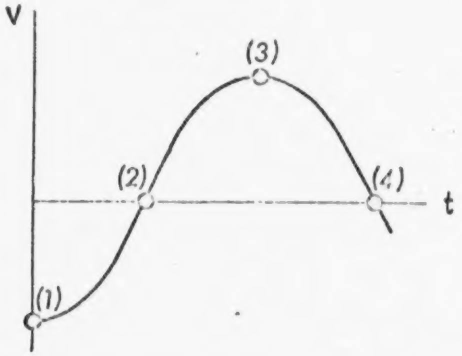
(B) 6 sec

(C) $2\sqrt{5}$ sec

(D) 35 sec

T.O 7 CR/RR

Select from the labeled points on the graph those which represent zero acceleration.



(A) 2,4 (B) 1, 3 (C) 1,2,3,4 (D) None of the points labeled.

T.O. 8 RR

Which of the following is *not* a true unit of power?

(A) horsepower

(B) watt

(C) kilowatt-hours

(D) $\frac{\text{ft-lb}}{\text{sec}}$

T.O. 9 CR

A boy throws a baseball straight up. It leaves his hand at a height of $y_o$ with an initial speed of $v_{oy}$ and rises to a height of y. The equation which may best be used to find the total time the ball takes to reach the ground is:

(A) $v_y = v_{oy} - gt$

(B) $y = y_o + v_{oy}t - \frac{1}{2} gt^2$

(C) $v_y^2 = v_{oy}^2 - 2g(y - y_o)$

(D) $y = y_o + \bar{v}_y t$

T.O. 10 CR

Three billiard balls are set in motion on a pool table. The velocity of ball A relative to ball C is $\vec{V}_{AC}$ .
The velocity of ball B relative to ball C is $\vec{V}_{BC}$ .
What is the velocity of ball A relative to ball B ?

(A) $\vec{V}_{AB} = \vec{V}_{AC} - \vec{V}_{BC}$

(B) $\vec{V}_{AB} = \vec{V}_{BC} - \vec{V}_{AC}$

(C) $\vec{V}_{AB} = \vec{V}_{AC} + \vec{V}_{BC}$

(D) $\vec{V}_{AB} = 0$

T.O. 11 CR

The position of a particle is given by the equation

$$x = v_{ox}t + \frac{1}{2} a_x t^2$$

The velocity of this particle is

(A) $v_x = \sqrt{v_{ox} + 2a_x(x - x_o)}$

(B) $v_x = v_{ox}^2 + 2a_x(x - x_o)$

(C) $v_x = v_{ox} + 1/2 a_x t^2$

(D) $v_x = v_{ox} + a_x t$

T.O. 12 CR

A stone is projected horizontally at a speed $v_o$ from the top of a building h meters high. For the information given, which expression may be used to find the downward velocity of the stone upon impact with the ground.

(A) $v_f^2 = v_o^2 + 2gs$

(B) $v_f = v_o + gt$

(C) $s = v_o t + \frac{1}{2} gt^2$

(D) None of the above since $v_o$ is in the horizontal direction.

T.O. 14

CR

Knowing the initial velocity of a body of mass m to be $v_o$, its final velocity, v, and the distance covered during this acceleration is s, what equation yields the force causing the acceleration?

A. $\frac{m(v - v_o)}{2s}$

B. $\frac{(v - v_o)}{2ms}$

C. $\frac{m(v - v_o)}{2t}$

D. $\frac{(v - v_o)}{mt}$

T.O. 15

RR

As the altitude of a satellite above the Earth increases, its mass

(A) increases

(B) decreases

(C) remains the same

(D) is zero

T.O. 16 CU

An astronaut maintains his orbit in space because of the Earth's gravitational attraction and his inertia. If the inward gravitational attraction is the action force, the reaction is:

(A) his inertia

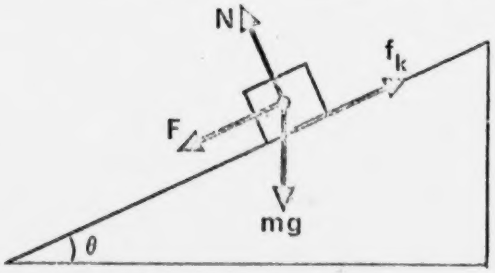
(B) zero, because he is "unattached" to the Earth

(C) equal to the gravitational force, but acting outward on him

(D) equal to the gravitational force, but acting on the Earth toward him

T.O. 17 CR

In the situation shown in the diagram, the force of kinetic friction is given by



*BLOCK SLIDING DOWN WITH CONSTANT ACCELERATION*

A. $\mu_k \, mg \cos\theta$

B. $\mu_k \, N \cos\theta$

C. $\mu_k \, F \sin\theta$

D. $\mu_k \, F \cos\theta$

T.O. 18 CR

What distance does an object which is revolving at f (constant) revolutions/sec cover each second?

(A) $\pi r^2 f$

(B) $\frac{f}{2\pi r}$

(C) $2\pi r f$

(D) $\frac{2\pi r}{f}$

T.O. 19 CU

When a centripetal force moves an object in a circular path at constant speed

A. The object undergoes a variable acceleration because its velocity varies

B. The object undergoes a constant acceleration because its velocity changes at a constant rate.

C. The object undergoes a variable acceleration because its direction varies

D. The object is not accelerated because its velocity remains constant

T.O. 20 CU

The work done by a constant force $\vec{F}$ in moving a mass m through a displacement $\vec{x}$, where the angle between $\vec{F}$ and $\vec{x}$ is always 180°, is

A. $\vec{F} \times \vec{x}$

B. $+Fx$

C. Zero

D. $-Fx$

T.O. 21 CR

The acceleration of a block of mass m varies linearly with displacement in the z-direction, i.e., $a = kz$. The equation which could be used to compute the work done on the block as it moves a distance $z_o$ is

A. $W = mkz_o$

B. $W = mkz_o^2$

C. $W = \int_0^{z_o} mkz\,dz$

D. $W = \int_0^{z_o} mkz^2 dz$

T.O. 22 CR

A particle of mass M attached to a string is rotated in a horizontal circle of radius R. The period of the motion is T. What instantaneous power is supplied by the centripetal force F (the tension)?

A. $F(2\pi R)/T$

B. $FR/T$

C. $F/T$

D. Zero

T.O. 23 CR

A large beachball of mass M is dropped from the roof of a building of height Y. The velocity of the ball before striking the ground is v. Which of the following expressions could be used to calculate the total resistive force f on the ball during its descent?

A. $Mg + f = Mv$

B. $MgY - fY = Mv^2/2$

C. $Mg + f = Mv^2/2$

D. $MgY - fY = Mv$

T.O. 24 CU

Which of the following statements is *not* true.

A. A force is conservative if the work done by the force on a particle that moves through any round trip is zero.

B. A force is conservative if the work done by the force on a particle that moves between two points depends on the path taken between those points.

C. The force exerted on an object by a spring is conservative.

D. The gravitational force is conservative.

T.O. 25 RR

The principle of the conservation of energy may be written as

(A) Energy may be created or destroyed and transformed from one kind to another.

(B) Energy may be transformed from one kind to another, but it cannot be created or destroyed.

(C) Energy may be created and transformed from one kind to another, but it cannot be destroyed.

(D) Energy may be created or destroyed, but not transformed from one kind to another.

T.O. 26 RR

The potential energy for an object of mass m a height h above the surface of the Earth is

(A) $1/2\ mh^2$

(B) $1/2\ mgh$

(C) $mgh$

(D) $2\ mgh$

T.O. 27 CU

The bob of a simple pendulum (mass m) is displaced from its equilibrium position such that the string (length R) holding the bob is horizontal. When the bob swings to the opposite side, how high above its equilibrium level does it go?

(A) $R/3$

(B) $R/2$

(C) $2R/3$

(D) $R$

T.O. 28 CR

Two point masses m and M are located at positions $\vec{r}$ and $\vec{R}$, respectively. The center of mass of this system is given by

(A) $(m\vec{r} + M\vec{R})/(m + M)$

(B) $(M\vec{R} - m\vec{r})/(m + M)$

(C) $M(\vec{r} + \vec{R})/(m + M)$

(D) $m(\vec{r} + \vec{R})/(m + M)$

T.O. 29 CU

Two objects attract each other, but are not under the influence of any other forces. Which of the following statements is true?

(A) the center of mass accelerates

(B) the center of mass may move at constant velocity

(C) the center of mass must be stationary

(D) a center of mass cannot be defined for interacting particles

T.O. 30 CR

An object of mass 2 kg moves to the right with a velocity of 4 m/sec; another object of mass 4 kg moves to the left with a velocity of 2 m/sec. What is the total momentum of the system?

(A) 16 kg-m/sec

(B) 8 kg-m/sec

(C) 4 kg-m/sec

(D) 0

T.O. 33

CR

A ball of mass $m$ grams strikes a wall horizontally with a velocity of $v$ cm/sec. Its velocity after rebounding from the wall is also $-v$ cm/sec. What is the average impulsive force exerted by the wall if the ball was in contact with the wall for $t$ sec?

(A) zero

(B) $mv$ dynes

(C) $mv/t$ dynes

(D) $2\,mv/t$ dynes

T.O. 34

An impulsive force proportional to time is applied to a block. The constant of proportionality is k, and the total time during which the force is applied is T.

If the impulse J is equal to 1/2 $kT^2$, what is the correct expression for the total time for which the impulsive force was applied.

A. J/F

B. Jk/F

C. $\sqrt{2J/k}$

D. $\sqrt{k/2J}$

T.O. 35

How may the magnitude of an impulse be found from a force vs time graph?

A. Impulse can be read directly from the graph.

B. Impulse is equal to the area under the graph.

C. Impulse is equal to the slope of the graph.

D. The highest point on the curve indicates the impulse.

T.O. 36

A collision between two fast moving objects causes both of them to come to a stop. Their momenta *before* the collision:

A. may have been identical

B. must have had a sum of zero

C. must have been dissipated during the collision

D. may have had different magnitudes

T.O. 37

Mass $m_1$ collides with mass $m_2$ (in one dimension). The masses have initial velocites $u_1$ and $u_2$, respectively. The respective final velocities $v_1$ and $v_2$ may be found from the relations

A. $m_1 u_1 + m_2 u_2 = (m_1 + m_2)v_1$
$v_1 = v_2$

B. $1/2\ m_1 u_1^2 + 1/2\ m_2 u_2^2 = 1/2\ (m_1 + m_2)v_1^2$
$v_1 = v_2$

C. $m_1 u_1 + m_2 u_2 = m_1 v_1 + m_2 v_2$
$1/2\ m_1 u_1^2 + 1/2\ m_2 u_1^2 = 1/2\ m_1 v_1^2 + 1/2\ m_2 v_2^2$

D. $1/2\ m_1 u_1^2 + 1/2\ m_2 u_1^2 = 1/2\ m_1(2\ v_1^2)$
$v_1 = v_2$

T.O. 38

Before colliding with mass $m_2$, which is moving due east, mass $m_1$ moves due south. The two masses stick together and move along a path due southeast. Which of the following statements must be true?

A. The masses must be equal.

B. The magnitude of the velocities, before the collision, must be equal.

C. The magnitude of their momenta before collision must be equal.

D. The total momentum must be zero.

T.O. 40

Two particles, A and B, undergo a gravitational attraction toward each other. If the mass of A is doubled, then

A. only B experiences an increased pull

B. only A experiences an increased pull

C. both A and B experience an increased pull

D. neither experience an increase since only one mass was changed.

T.O. 41

If the distance between two masses is halved, the gravitational force attracting each of them will be

A. halved
B. quartered
C. doubled
D. quadrupled

T.O. 42

The orbital radius of a satellite around the Earth is twice the radius of the Earth. The weight of an astronaut in the satellite, compared to his weight on Earth will be

A. the same
B. one-half
C. one-fourth
D. zero, i.e., weightless

T.O. 43

Inertial and gravitational masses are conceptually distinct, although experimentally the same. We use the symbol, m, to denote both kinds of masses.

Select, from the choices below, the equation in which m stands for inertial mass.

A. $\vec{p} = m\vec{v}$

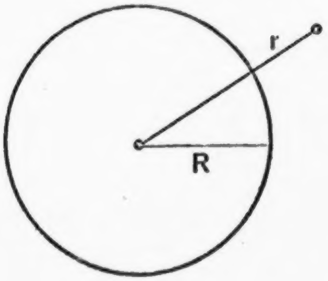
B. $F = G\ Mm/r^2$

C. $g = Gm/r_e^2$

D. $U = mgh$

T.O. 46

For the spherical shell of radius R and mass M in the accompanying diagram, what is the magnitude of the gravitational field strength at the point shown (outside shell), a distance r from the center.



A. zero

B. $-\dfrac{GM}{r^2}$

C. $-\dfrac{GMr}{R^3}$

D. $-\dfrac{GM}{(r - R)^2}$

T.O. 47

The gravitational potentials due separately to the Earth and the moon at a point between the Earth and moon are $V_e$ and $V_m$, respectively. The gravitational potential at this point is

A. the vector sum of $V_e$ and $V_m$

B. the vector difference between $V_e$ and $V_m$

C. the scalar sum of $V_e$ and $V_m$

D. the scalar difference between $V_e$ and $V_m$

T.O. 48

For gravitational problems associated with small distances (compared to the Earth's radius) from the surface of the Earth, the zero potential reference level is conventionally taken at

A. the center of the Earth

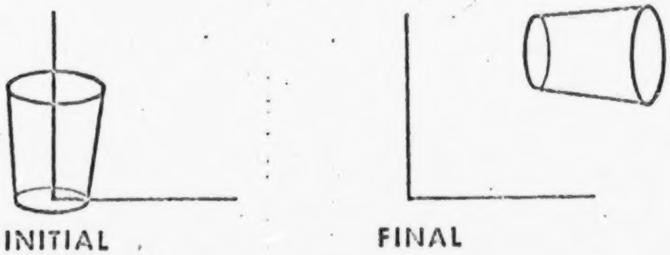
B. the surface of the Earth

C. the position of the particle under consideration

D. infinity

50

S45-C1



In the diagram, a tumbler is shown in its initial and final positions. This motion requires

A. translation alone
B. rotation alone
C. translation and rotation
D. a process which involves neither rotation nor translation

51

S45-C8

A phonograph turntable rotates at ω revolutions per minute. An eraser is placed on the turntable at a distance r from the central spindle.

The angle (in radians) subtended by the eraser is time t is given by

A. $\omega r$
B. $\omega r t$
C. $rt$
D. $\omega t$

52

S45-C14

A phonograph turntable rotates in a clockwise direction. The direction of the angular velocity is

A. clockwise
B. tangential to the rim
C. upward
D. downward

53

S45-C25

A turntable rotates with uniform angular acceleration $\alpha$ from an initial angular velocity $\omega_o$ to a final angular velocity $\omega$. The angle through which the turntable rotates is

A. $(\omega^2 - \omega_o{}^2)/2\alpha$

B. $(\omega^2 - \omega_o{}^2)/\alpha$

C. $(\omega^2 + \omega_o{}^2)/2\alpha$

D. $(\omega^2 + \omega_o{}^2)\alpha$

T.O. 34

An impulsive force proportional to time is applied to a block. The constant of proportioality is k, and the total time during which the force is applied is T.

The impulse, J, is equal to:

A. $\int_0^T kt\,dt$

B. kT

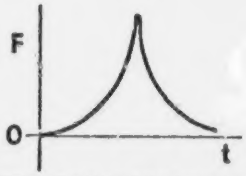
C. 1/2 kT

D. $k\int_T^0 t\,dt$

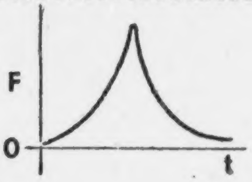
---

T.O. 35

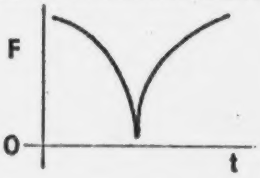
The accompanying graph shows the force on one of two objects during a collision. Select the graph which best illustrates the force on the other object.



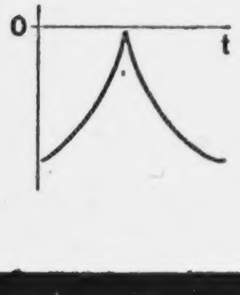
A.



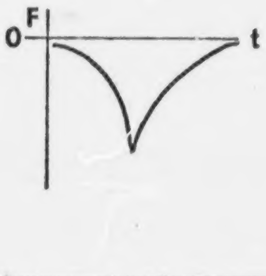
C.



B.



D.



T.O. 36

All collisions between isolated objects

A. conserve momentum

B. conserve energy

C. conserve both momentum and energy

D. conserve neither energy nor momentum

T.O. 37

Particle B is at rest when it is struck by particle A. The particles stick together and the composite moves with one third of the initial speed of particle A. This implies that the mass of particle B is

A. half the mass of particle A
B. equal to the mass of particle A
C. twice the mass of particle A
D. three times the mass of particle A

T.O. 38

An idealized "super" ball strikes the ground at some angle to the vertical, then rebounds along a path at the same angle to the other side of the vertical. The ball's initial and final speeds are equal. Which of the following statements is correct?

A. Energy, and not momentum, of the ball is conserved.

B. Momentum, and not energy, of the ball is conserved.

C. Both energy and momentum of the ball are conserved.

D. Neither energy nor momentum of the ball is conserved.

T.O. 40

The moon has approximately 1/6 the mass of the Earth. The value for the gravitational constant, G, if measured on the moon, compared to G measured on the Earth would be:

A. G/6

B. G

C. 6 G

D. G/36

T.O. 41

Two masses experience a gravitational force of attraction between them. Mass $m_1$ is twice mass $m_2$. The force on mass $m_1$ has magnitude

A. $G\frac{m_1^2}{r^2}$

B. $G\frac{m_1^2}{2r^2}$

C. $G\frac{2m_1^2}{r^2}$

D. $G\frac{4m_1}{r^2}$

T.O. 42

Planet X has twice the mass of the Earth but a radius of one-half of the Earth's . Planet Y has 4 times the Earth's mass and also 1/2 of Earth's radius. Planet Z has half the mass and half the radius as the Earth. On which planet(s) would your weight be the same as it is on Earth?

A. planet X only

B. planet Y only

C. planet Z only

D. planets X, Y, and Z

T.O. 43

[illegible] a mass is carried away from gravitating bodies, its [illegible]ertial mass remains the same while its gravitational mass

A. increases

B. decreases

C. also remains the same

D. varies according to its environment

T.O. 46

The gravitational field strength, $\gamma$, and the centripetal acceleration, $a_c$, of a point on the equator are related to the acceleration of free-fall, g, by the expression

A. $2\gamma - a_c$

B. $\gamma + 2\ a_c$

C. $\gamma - a_c$

D. $\gamma + a_c$

T.O. 47

The gravitational potential at a point located a distance x from the center of the Earth (mass $M_e$ radius R) when $x > R$ is given by

A. $-GMx/R^2$

B. $-GM/R^2$

C. $-GM/x^2$

D. $-GMR/x^2$

T.O. 48

If a ball of mass m thrown vertically up reaches a height h, then the initial kinetic energy must have been equal to

A. $\sqrt{gh/2}$

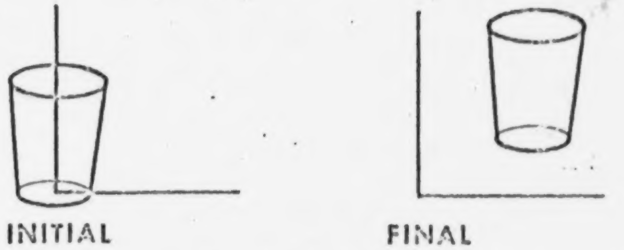
B. $\sqrt{2gh}$

C. mgh

D. 2mgh

50

S45-C1



In the diagram, a tumbler is shown in its initial and final positions. This motion requires

A. translation alone
B. rotation alone
C. translation and rotation
D. a process which involves neither rotation nor translation

51

S45-C8

A phonograph turntable makes one complete revolution every 2 seconds. What angle does the turntable rotate through in 1 second?

A. $2\pi$ radians

B. $\pi$ radians

C. $\pi/2$ radians

D. $\pi/4$ radians

52

S45-C14

An automobile decelerates on a straight road. The direction of the angular velocity of the wheels is

A. clockwise

B. counterclockwise

C. along the axle and pointing out of the driver's left side

D. along the axle and pointing out of the driver's right side

53

S45-C25

A wheel rotating with angular velocity $\omega_o$ undergoes a uniform angular acceleration for a duration of t. During this time, the wheel rotates through an angle $\theta$. The angular acceleration is equal to

A. $\omega_o^2/(2\theta)$

B. $2(\theta - \omega_o t)/t^2$

C. $\omega_o/t$

D. $\theta/t - \omega_o$

T.O. 34

A bullet is fired from a rifle. Which of the following statements is true?

A. Only the bullet experiences an impulse.

B. Only the rifle experiences an impulse

C. The impulse experienced by the bullet is greater than that experienced by the rifle.

D. The impulse experienced by the bullet is equal to that experienced by the rifle.

---

T.O. 35

An impulsive force proportional to time is applied to an object. If the constant of proportionality is k, then the force vs time graph would:

A. have a slope equal to k

B. have a force-intercept equal to k

C. have a time-intercept equal to k

D. have a radius of curvature equal to k

T.O. 36

A large mass and a small mass collide and adhere to each other.

A. the momenta of both masses had the same initial magnitude

B. the total momentum is zero

C. momentum is lost in the process

D. energy is lost in the process

T.O. 37

Two equal masses, $m_1$ and $m_2$, collide and stick together. Mass $m_2$ is initially at rest. Which choice best describes the motion.

A. After collision, both masses are at rest.

B. After collision, both masses move together at the original speed of $m_1$.

C. After collision, both masses move together with half the original speed of $m_1$.

D. After collision, both masses move togehter with one-quarter the original speed of $m_1$.

T.O. 38

An idealized "super" ball strikes the ground at some angle to the vertical, then rebounds along a path at the same angle to the other side of the vertical. The ball's initial and final speeds are equal. Which of the following statements is correct?

A. Energy, and not momentum of the ball-Earth system is conserved.

B. Momentum, and not energy of the ball-Earth system is conserved.

C. Both energy and momentum of the ball-Earth system are conserved.

D. Neither energy nor momentum of the ball-Earth system is conserved.

T.O. 40

Ideally, where must a scientist locate his laboratory in order to measure the gravitational constant, G?

A. at sea level on the Earth

B. any place, so long as it is affected by Earth's gravity.

C. in a vacuum, removed from the influence of gravity

D. any place in the universe he is able to afford

T.O. 41

Two masses experience a gravitational attraction between them. Mass $m_1$ is twice mass $m_2$. The gravitational force on $m_1$ is $\vec{F}_1$ and that on $m_2$ is $\vec{F}_2$. Which statement is correct?

A. $\vec{F}_1 = \vec{F}_2$

B. $|\vec{F}_1| > |\vec{F}_2|$

C. $|\vec{F}_1| < |\vec{F}_2|$

D. $\vec{F}_1 = -\vec{F}_2$

T.O. 42

As a mountain climber climbs to the top of a mountain his weight decreases. As a miner descends below sea level into a mine shaft, his weight

A. increases due to the attraction of the Earth's core

B. increases due to a loss of bouyancy

C. decreases

D. remains the same

T.O. 43

You take two accurate clocks on a trip from Earth to Mars. One is an old favorite Grandfather clock with a pendulum timer; the other a spring wound clock. On Mars, you would find that

A. both clocks continue to keep accurate time

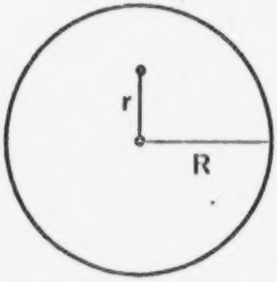
B. both clocks gain or loose equal amounts

C. only the Grandfather clock runs slow

D. only the spring wound clock runs slow

T.O. 46

For a spherical shell of radius R and mass M in the accompanying diagram, what is the magnitude of the gravitational field strength at the point shown (inside shell), a distance r from the center.



A. zero

B. $-\frac{GM}{r^2}$

C. $-\frac{GMr}{R^3}$

D. $-\frac{GM}{(R-r)^2}$

T.O. 47

The gravitational potential at the surface of the Earth (mass $M_e$, radius R) is given by

A. $GM/R^2$

B. $-GM/R^2$

C. $GM/R$

D. $-GM/R$

T.O. 48

If an object is projected upward with initial kinetic energy, K, from a height h above the ground, its kinetic energy upon impact with the ground must be

A. K

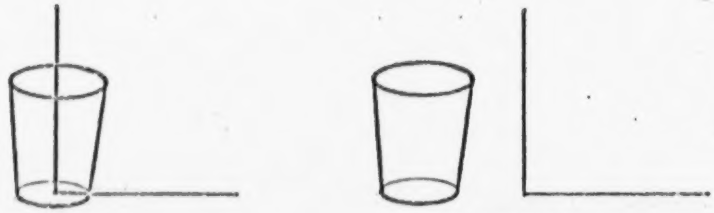
B. mgh

C. K - mgh

D. K + mgh

50

S45-C1



In the diagram, a tumbler is shown in its initial and final positions. This motion requires

A. translation alone
B. rotation alone
C. translation and rotation
D. a process which involves neither rotation nor translation

51

S45-C8

An angle of 45° is equal to

A. π/2 radians

B. 1 radian

C. π/4 radians

D. 1/2 radians

52

S45-C14

A phonograph turntable begins rotating from rest in a clockwise direction. The direction of the angular acceleration is

- A. clockwise
- B. tangential to the rim
- C. upward
- D. downward

53

S45-C25

A wheel starts from rest and undergoes a uniform angular acceleration $\alpha$ for a duration t. Through what angle does the wheel rotate in this time?

- A. $\alpha t^2/2$
- B. $\alpha/t$
- C. $\alpha t^2$
- D. $\alpha t$

[illegible]

T.O. 34

An impulsive force proportional to time is applied to a block. The constant of proportionality is k, and the total time during which the force is applied is T.

If the impulse J is equal to 1/2 $kT^2$, what is the correct expression for the total time for which the impulsive force was applied.

A. J/F

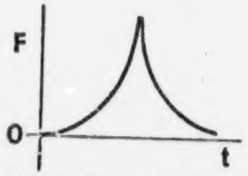
B. Jk/F

C. $\sqrt{2J/k}$

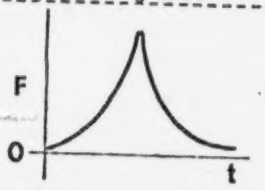
D. $\sqrt{k/2J}$

T.O. 35

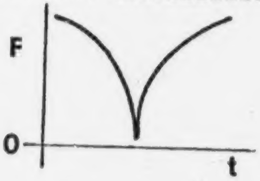
The accompanying graph shows the force on one of two objects during a collision. Select the graph which best illustrates the force on the other object.



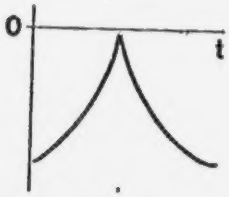
A.



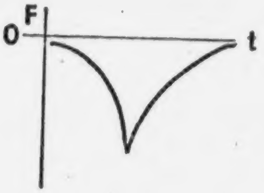
C.



B.



D.



T.O. 36

[illegible] collision between two fast moving objects causes both of them to come to a stop. Their momenta *before* the collision:

A. may have been identical

B. must have had a sum of zero

C. must have been dissipated during the collision

D. may have had different magnitudes

T.O. 37

Particle B is at rest when it is struck by particle A. The mass of particle B is twice the mass of particle A, and they stick together after the collision. The speed of the composite

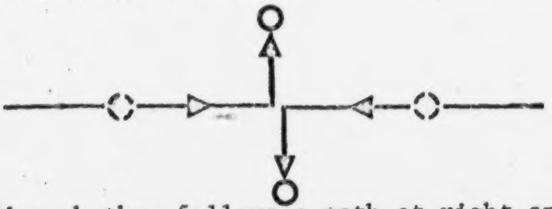
A. is one-third the initial speed of particle A

B. is one-half the initial speed of particle A

C. is equal to the speed of particle A

D. depends upon the energy loss due to the adhesion

T.O. 38



Two masses collide and each then follows a path at right angles to the incident path as in the diagram. Which statement below must be true in this instance?

A. The total momentum before the collision is zero.

B. The masses must be equal.

C. The magnitudes of the velocities, before the collision, must be equal.

D. The collision must be totally elastic.

T.O. 40

The moon has approximately 1/6 the mass of the Earth. The value for the gravitational constant, G, if measured on the moon, compared to G measured on the Earth would be:

A. G/6

B. G

C. 6 G

D. G/36

T.O. 41

Two masses experience a gravitational attraction between them. Mass $m_1$ is twice mass $m_2$. The gravitational force on $m_1$ is $\vec{F}_1$ and that on $m_2$ is $\vec{F}_2$. Which statement is correct?

A. $\vec{F}_1 = \vec{F}_2$

B. $|\vec{F}_1| > |\vec{F}_2|$

C. $|\vec{F}_1| < |\vec{F}_2|$

D. $\vec{F}_1 = -\vec{F}_2$

T.O. 42

As a mountain climber climbs to the top of a mountain his weight decreases. As a miner descends below sea level into a mine shaft, his weight

A. increases due to the attraction of the Earth's core

B. increases due to a loss of bouyancy

C. decreases

D. remains the same

T.O. 43

You take two accurate clocks on a trip from Earth to Mars. One is an old favorite Grandfather clock with a pendulum timer; the other a spring wound clock. On Mars, you would find that

A. both clocks continue to keep accurate time

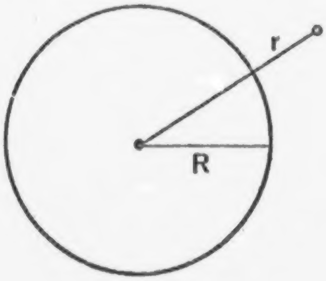
B. both clocks gain or loose equal amounts

C. only the Grandfather clock runs slow

D. only the spring wound clock runs slow

T.O. 46

For the spherical shell of radius R and mass M in the accompanying diagram, what is the magnitude of the gravitational field strength at the point shown (outside shell), a distance r from the center.



A. zero

B. $-\frac{GM}{r^2}$

C. $-\frac{GMr}{R^3}$

D. $-\frac{GM}{(r - R)^2}$

T.O. 47

The gravitational potential at a point located a distance x from the center of the Earth (mass $M_e$ radius R) when $x > R$ is given by

A. $-GMx/R^2$

B. $-GM/R^2$

C. $-GM/x^2$

D. $-GMR/x^2$

T.O. 48

If [illegible] ball of mass m thrown vertically up reaches a height h, th[illegible] the initial kinetic energy must have been equal to

A. $\sqrt{gh/2}$

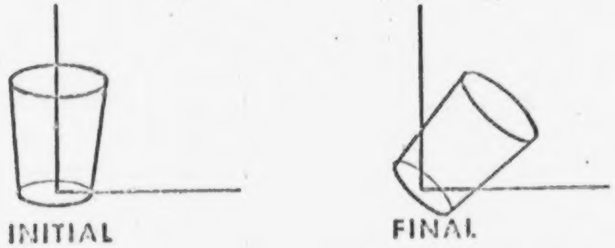
B. $\sqrt{2gh}$

C. mgh

D. 2mgh

50

S45-C1



In the diagram, a tumbler is shown in its initial and final positions. This motion requires

A. translation alone
B. rotation alone
C. translation and rotation
D. a process which involves neither rotation nor translation

51

S45-C8

A phonograph turntable makes one complete revolution every 2 seconds. What angle does the turntable rotate through in 1 second?

A. $2\pi$ radians

B. $\pi$ radians

C. $\pi/2$ radians

D. $\pi/4$ radians

52

S45-C14

A phonograph turntable rotates in a clockwise direction. The direction of the angular velocity is

A. clockwise
B. tangential to the rim
C. upward
D. downward

53

S45-C25

A wheel rotating with angular velocity $\omega_o$ undergoes a uniform angular acceleration for a duration of t. During this time, the wheel rotates through an angle $\theta$. The angular acceleration is equal to

A. $\omega_o^2/(2\theta)$

B. $2(\theta - \omega_o t)/t^2$

C. $\omega_o/t$

D. $\theta/t - \omega_o$

TEST [illegible]

T.O. 34

An impulsive force proportional to time is applied to a block. The constant of proportioality is k, and the total time during which the force is applied is T.

The impulse, J, is equal to:

A. $\int_0^T kt\,dt$

B. kT

C. 1/2 kT

D. $k\int_T^0 t\,dt$

T.O. 35

An impulsive force proportional to time is applied to an object. If the constant of proportionality is k, then the force vs time graph would:

A. have a slope equal to k

B. have a force-intercept equal to k

C. have a time-intercept equal to k

D. have a radius of curvature equal to k

T.O. 36

All collisions between isolated objects

A. conserve momentum

B. conserve energy

C. conserve both momentum and energy

D. conserve neither energy nor momentum

T.O. 37

Two equal masses, $m_1$ and $m_2$, collide and stick together. Mass $m_2$ is initially at rest. Which choice best describes the motion.

A. After collision, both masses are at rest.

B. After collision, both masses move together at the original speed of $m_1$.

C. After collision, both masses move together with half the original speed of $m_1$.

D. After collision, both masses move togehter with one-quarter the original speed of $m_1$.

T.O. 38

An idealized "super" ball strikes the ground at some angle to the vertical, then rebounds along a path at the same angle to the other side of the vertical. The ball's initial and final speeds are equal. Which of the following statements is correct?

A. Energy, and not momentum, of the ball is conserved.

B. Momentum, and not energy, of the ball is conserved.

C. Both energy and momentum of the ball are conserved.

D. Neither energy nor momentum of the ball is conserved.

T.O. 40

Ideally, where must a scientist locate his laboratory in order to measure the gravitational constant, G?

A. at sea level on the Earth

B. any place, so long as it is affected by Earth's gravity.

C. in a vacuum, removed from the influence of gravity

D. any place in the universe he is able to afford

T.O. 41

Two masses experience a gravitational force of attraction between them. Mass $m_1$ is twice mass $m_2$. The force on mass $m_1$ has magnitude

A. $G \frac{m_1{}^2}{r^2}$

B. $G \frac{m_1{}^2}{2r^2}$

C. $G \frac{2m_1{}^2}{r^2}$

D. $G \frac{4m_1}{r^2}$

T.O. 42

The orbital radius of a satellite around the Earth is twice the radius of the Earth. The weight of an astronaut in the satellite, compared to his weight on Earth will be

A. the same
B. one-half
C. one-fourth
D. zero, i.e., weightless

T.O. 43

[illegible] a mass is carried away from gravitating bodies, its inertial mass remains the same while its gravitational mass

A. increases

B. decreases

C. also remains the same

D. varies according to its environment

T.O. 46

The gravitational field strength, $\gamma$, and the centripetal acceleration, $a_c$, of a point on the equator are related to the acceleration of free-fall, g, by the expression

A. $2\gamma - a_c$

B. $\gamma + 2\ a_c$

C. $\gamma - a_c$

D. $\gamma + a_c$

T.O. 47

The gravitational potential at a point located a distance x from the center of the Earth (mass $M_e$, radius R) is given by

A. $GM/x^2$ $\quad x > R$

B. $-GMR/x^2$ $\quad x > R$

C. $GM/R$ $\quad x > R$

D. $-GM/x$ $\quad x > R$

T.O. 48

For gravitational problems associated with small distances (compared to the Earth's radius) from the surface of the Earth, the zero potential reference level is conventionally taken at

A. the center of the Earth

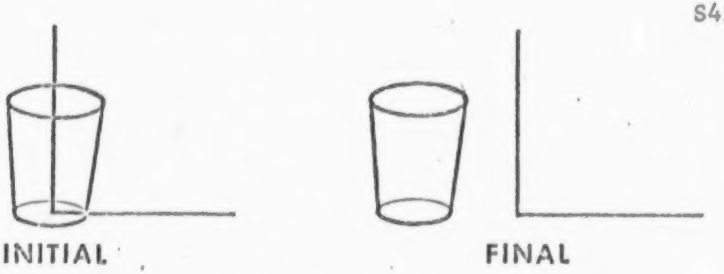
B. the surface of the Earth

C. the position of the particle under consideration

D. infinity

50

S45-C1



In the diagram, a tumbler is shown in its initial and final positions. This motion requires

A. translation alone
B. rotation alone
C. translation and rotation
D. a process which involves neither rotation nor translation

51

S45-C8

An angle of 90° is equal to

A. $\pi$ radians

B. 1 radian

C. $\pi/2$ radians

D. 1/2 radian

52

S45-C14

A phonograph turntable begins rotating from rest in a clockwise direction. The direction of the angular acceleration is

A. clockwise
B. tangential to the rim
C. upward
D. downward

53

S45-C25

A turntable rotates with uniform angular acceleration $\alpha$ from an initial angular velocity $\omega_o$ to a final angular velocity $\omega$. The angle through which the turntable rotates is

A. $(\omega^2 - \omega_o^2)/2\alpha$

B. $(\omega^2 - \omega_o^2)/\alpha$

C. $(\omega^2 + \omega_o^2)/2\alpha$

D. $(\omega^2 + \omega_o^2)\alpha$

Test Mo

T.O. 34

A bullet is fired from a rifle. Which of the following statements is true?

A. Only the bullet experiences an impulse.

B. Only the rifle experiences an impulse

C. The impulse experienced by the bullet is greater than that experienced by the rifle.

D. The impulse experienced by the bullet is equal to that experienced by the rifle.

T. . 35

How may the magnitude of an impulse be found from a force vs time graph?

A. Impulse can be read directly from the graph.

B. Impulse is equal to the area under the graph.

C. Impulse is equal to the slope of the graph.

D. The highest point on the curve indicates the impulse.

T.O. 36

A large mass and a small mass collide and adhere to each other.

A. the momenta of both masses had the same initial magnitude

B. the total momentum is zero

C. momentum is lost in the process

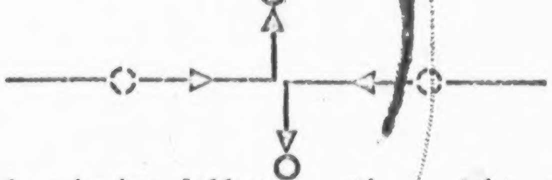
D. energy is lost in the process

T.O. 37

Particle B is at rest when it is struck by particle A. The particles stick together and the composite m[illegible]s with one third of the initial speed of particle A. [illegible]s implies that the mass of particle B is

A. half the mass of particle A
B. equal to the mass of particle A
C. twice the mass of particle A
D. three times the mass of particle [illegible]

T.O. 38



Two masses collide and each then follows a path at right angles to the incident path as in the diagram. Which statement below must be true in this instance?

A. The total momentum before the collision is zero.

B. The masses must be equal.

C. The magnitudes of the velocities, before the collision, must be equal.

D. The collision must be totally elastic.

T.O. 40

Two particles, A and B, undergo a gravitational attraction toward each other. If the mass of A is doubled, then

A. only B experiences an increased pull

B. only A experiences an increased pull

C. both A and B experience an increased pull

D. neither experience an increase since only one mass was changed.

T.O. 41

If the distance between two masses is halved, the gravitational force attracting each of them will be

A. halved
B. quartered
C. doubled
D. quadrupled

T.O. 42

Planet X has twice the mass of the Earth but a radius of one-half of the Earth's . Planet Y has 4 times the Earth's mass and also 1/2 of Earth's radius. Planet Z has half the mass and half the radius as the Earth. On which planet(s) would your weight be the same as it is on Earth?

A. planet X only

B. planet Y only

C. planet Z only

D. planets X, Y, and Z

T.O. 43

Inertial and gravitational masses are conceptually distinct, although experimentally the same. We use the symbol, m, to denote both kinds of masses.

Select, from the choices below, the equation in which m stands for gravitational mass.

A. $\vec{F} = m\vec{a}$

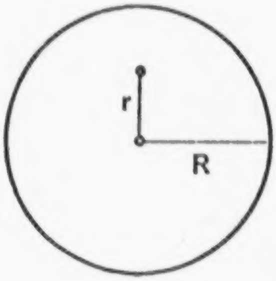
B. $U = mgh$

C. $F = mv^2/r$

D. $K = 1/2\ mv^2$

T.O. 46

For a spherical shell of radius R and mass M in the accompanying diagram, what is the magnitude of the gravitational field strength at the point shown (inside shell), a distance r from the center.



A. zero

B. $-\frac{GM}{r^2}$

C. $-\frac{GMr}{R^3}$

D. $-\frac{GM}{(R-r)^2}$

T.O. 47

The gravitational potentials due separately to the Earth and the moon at a point between the Earth and moon are $V_e$ and $V_m$, respectively. The gravitational potential at this point is

A. the vector sum of $V_e$ and $V_m$

B. the vector difference between $V_e$ and $V_m$

C. the scalar sum of $V_e$ and $V_m$

D. the scalar difference between $V_e$ and $V_m$

T.O. 48.

Neglecting influences of air friction and other celestial bodies, the minimum amount of kinetic energy a body must have in order to escape the Earth's gravitational pull must be

A. a function of the body's weight

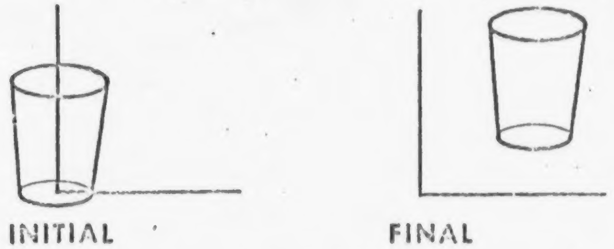
B. a function of the body's mass

C. equal to the difference in potential energy of the body at the surface of the Earth and at infinity

D. equal to the potential energy of the body with respect to the center of the Earth as a reference level

50

S45-C1



In the diagram, a tumbler is shown in its initial and final positions. This motion requires

A. translation alone
B. rotation alone
C. translation and rotation
D. a process which involves neither rotation nor translation

51

S45-C8

A phonograph turntable rotates at ω revolutions per minute. An eraser is placed on the turntable at a distance r from the central spindle.

The angle (in radians) subtended by the eraser is time t is given by

A. ωr
B. ωrt
C. rt
D. ωt

52

S45-C14

An automobile decelerates on a straight road. The direction of the angular velocity of the wheels is

A. clockwise

B. counterclockwise

C. along the axle and pointing out of the driver's left side

D. along the axle and pointing out of the driver's right side

53

S45-C25

A wheel starts from rest and undergoes a uniform angular acceleration $\alpha$ for a duration t. Through what angle does the wheel rotate in this time?

A. $\alpha t^2/2$

B. $\alpha/t$

C. $\alpha t^2$

D. $\alpha t$

Nu

T.O. 49 CR

Two charges +q and -q are placed a distance r apart. The force acting on the charge +q is

A. Attractive

B. repulsive

C. greater than the force acting on the charge -q

D. less than the force acting on the charge -q

T.O. 50 RR

The charge developed on an insulated rubber rod rubbed with fur is designated

A. positive

B. neutral

C. negative

D. none of the above.

T.O. 51 CU

A glass rod is rubbed with silk. A certain quantity of positive charge appears on the glass rod. The quantity of negative charge transferred to silk is

A. same as that on the glass rod

B. less than that on glass rod

C. more than that on glass rod

D. not connected to the quantity of charge on glass rod.

T.O. 52

RR

The expression for the force $\vec{F}$ acting on a charge q placed in an electric field $\vec{E}$ is

A. $\vec{F} = \frac{\vec{E}}{q}$

B. $\vec{F} = \frac{1}{4\pi\epsilon_o} \frac{\vec{E}}{q}$

C. $\vec{F} = q\vec{E}$

D. $\vec{F} = \frac{q\vec{E}}{4\pi\epsilon_o}$

T.O. 53

PS

Two point charges 2q and q are placed at (o,o) and (a,o) respectively in a given x-y coordinate system. The electric field $\vec{E}$ at $(\frac{a}{2},o)$ due to the two charges is

A. $\frac{q\ \hat{i}}{2\pi\epsilon_o a^2}$

B. $\frac{q\ \hat{i}}{\pi\epsilon_o a^2}$

C. 0

D. $\frac{2q\ \hat{i}}{\pi\epsilon_o a^2}$

T.O. 54

RR

Two uncharged pith balls are touched by a positively charged rubber rod. If the pith balls were in contact before being touched by the rubber rod, what happens immediately afterwards?

A. The pith balls remain in contact

B. The pith balls move away from each other

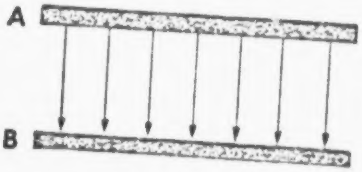
C. The pith balls attract each other

D. The pith balls are not effected by the presence of the rubber rod.

T.O. 55

RR

Refer to the electric field lines drawn below. What observation can be made about the nature of charges on plates A and B?



A. A is positively charged and B is negatively charged
B. B is positively charged and A is negatively charged
C. A and B are both positively charged
D. A and B are both negatively charged

---

T.O. 56

CR

A dipole with dipole moment $\vec{P} = 2q\,a\,\hat{i}$ is placed in a uniform electric field $\vec{E} = \vec{E}\,\hat{i}$. The magnitude of the force acting on the dipole is

A. 2qa E

B. zero

C. -2qa E

D. qa E

---

T.O. 60

CR

A nonconducting infinite sheet, coincident with y-z plane has surface charge density $\sigma$ (charge per unit area) and a point charge q is confined at a point (a,o,o). The electric field $\vec{E}$ due to the charge sheet and the point charge at a point (2a, o, o) is

A. $\frac{\sigma q}{2\epsilon_o}\,\hat{i}$

B. $\left(\frac{\sigma}{2\epsilon_o} + \frac{q}{16\pi\epsilon_o a^2}\right)\hat{i}$

C. $\left(\frac{\sigma}{2\epsilon_o} + \frac{q}{4\pi\epsilon_o a^2}\right)\hat{i}$

D. $\left(\frac{\sigma}{2\epsilon_o a} + \frac{q}{4\pi\epsilon_o a^2}\right)\hat{i}$

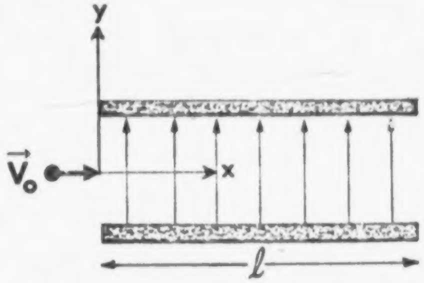
A uniform electric field $\vec{E} = E_o \hat{j}$ exists between two charged parallel plates of length $\ell$ as shown below. A particle of mass m and charge q enters the region of electric field at the origin with velocity $\vec{v} = v_o \hat{i}$. The x-component of the acceleration of the particle is

A. $\frac{q E_o}{m}$

B. 0

C. $\frac{mq}{E_o}$

D. $mq E_o$



T.O. 62 CR

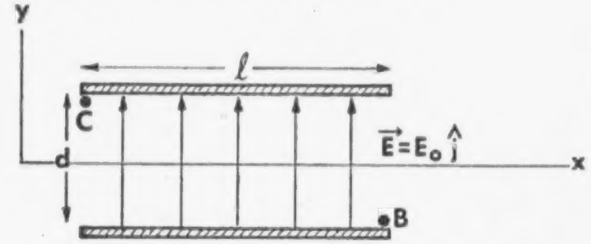
Two parallel plates of length $\ell$ are separated by a distance d. A uniform electric field $\vec{E}=E_o \hat{j}$ exists between the plates. If a charge q is moved from a point B to a point C, the work done is

A. $q E_o d$

B. $\frac{q E_o}{d}$

C. 0

D. $q E_o \ell d$



T.O. 63 CR

A particle of charge q is moved from $x = x_1$ to $x = x_2$ in an electric field $\vec{E}(y) = \frac{1}{y^2} \hat{j}$. The work done is

A. $-q\int_{x_1}^{x_2} \frac{1}{y^2}\, dx$

B. zero

C. $q\int_{x_1}^{x_2} \frac{1}{y^2}\, dx$

D. $\frac{q}{y_2} - \frac{q}{y_1}$

T.O. 64 RR

In calculating electric flux through a surface due to an electric field, one must know

A. only the electric field vector and magnitude of the area

B. only magnitude of the electric field and magnitude of the area

C. only magnitude of the electric field and the surface area vector

D. only the elctric field vector and the surface area vector

T.O. 65 CR

A surface of area S is coincident with y-z plane. If a uniform electric field $\vec{E}=E_o\,\hat{j}$ exists throughout the space in consideration, the electric flux through the surface is

A. $\frac{S}{E}$

B. 0

C. $SE_o\,\hat{j}$

D. $SE_o$

T.O. 66 CU

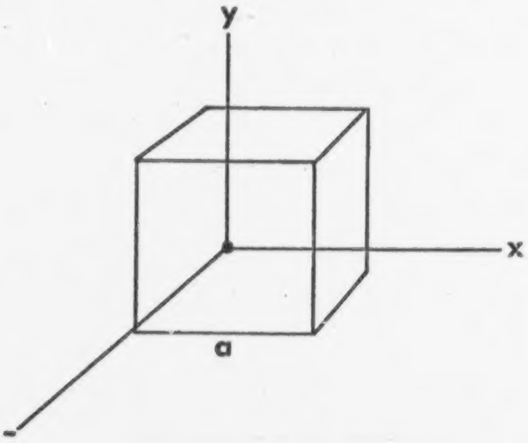
A cube of side a is placed in an uniform electric field $\vec{E} = E_o\hat{i}$ as shown in the diagram. The total electric flux through the cubical surface is

A. $6\,E_oa^2$

B. zero

C. $E_oa^3$

D. $2\,E_oa^2$



T.O. 67

RR

The general form of Gauss's law is

A. $\oint \vec{E}\cdot d\vec{S} = \varepsilon_o q$

B. $\oint \vec{E}\cdot d\vec{S} = \frac{q}{\varepsilon_o}$

C. $\oint \vec{E}\cdot d\vec{S} = \frac{q}{4\pi\varepsilon_o}$

D. $q\oint \vec{E}\cdot d\vec{S} = \varepsilon_o$

T.O. 68

CR

Two concentric spherical conductors of radii a and b ($b > a$) carry charges q and $-q$ respectively. The magnitude of electric field for $a < r < b$ is

A. $\frac{q}{4\pi\varepsilon_o r^2}$

B. $\frac{q}{4\pi\varepsilon_o}\left(\frac{1}{a^2} - \frac{1}{b^2}\right)$

C. zero

D. $\frac{q}{4\pi\varepsilon_o a^2}$

T.O. 69

FS

Two concentric spherical conductors of radii a and b ($b > a$) carry charges $q_1$ and $q_2$ respectively. The magnitude of the electric field at points $a < r < b$ is

A. dependent upon $q_1$ and $q_2$
B. dependent upon $q_1$ and a
C. dependent upon $q_1$ and r
D dependent upon $q_2$ and b

T.O. 71

CR

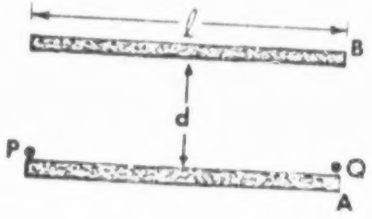
Two parallel plates A and B of length $\ell$ are separated by distance d and are maintained at electric potentials $V_A$ and $V_B$ respectively. If a charge q is moved from point P to point Q, the work done is

A. $2q\ell d(V_B - V_A)$

B. zero

C. $q\ell(V_B - V_A)$

D. $qd(V_B - V_A)$



T.O. 72

RR

The electric potential due to a point charge $4|q_e|$ at a distanc 2r from it is

A. $\frac{1}{4\pi\varepsilon_o}\frac{|q_e|}{r^2}$

B. $\frac{1}{4\pi\varepsilon_o}\frac{2|q_e|}{r}$

C. $\frac{1}{4\pi\varepsilon_o}\frac{2|q_e|}{r^2}$

D. $\frac{1}{4\pi\varepsilon_o}\frac{|q_e|}{r}$

T.O. 73

CR

Two charges q and 4q are separated by a distance 2a. The electric potential at the midpoint of the line joining the two charges is

A. $\frac{1}{4\pi\varepsilon_o}\frac{3q}{a^2}$

B. $\frac{1}{4\pi\varepsilon_o}\frac{3q}{a}$

C. $\frac{1}{4\pi\varepsilon_o}\frac{5q}{a}$

D. $\frac{1}{4\pi\varepsilon_o}\frac{5q}{a^2}$

T.O. 74

CR

A spherical conductor of radius R carries charge q. The electric potential for points $r < R$ is

A. zero

B. $\frac{q}{4\pi\varepsilon_o R^2}$

C. $\frac{q}{4\pi\varepsilon_o r}$

D. $\frac{q}{4\pi\varepsilon_o R}$

T.O. 75

CR

The electric potential at a point due to certain charge distribution is $V = \frac{1}{4\pi\varepsilon_o}\frac{q}{x^2}$. The magnitude of x-component of electric field $E_x$ is

A. $\frac{1}{2\pi\varepsilon_o}\frac{q}{x^3}$

B. $-\frac{1}{4\pi\varepsilon_o}\frac{q}{x}$

C. zero

D. $\frac{1}{4\pi\varepsilon_o}\frac{q}{x^2}$

T.O. 76

CR

Two charges q and -q are placed a distance a apart. The electric potential energy of the system is

A. zero

B. $\frac{-q^2}{4\pi\epsilon_o a}$

C. $\frac{-q^2}{4\pi\epsilon_o a^2}$

D. $\frac{q^2}{4\pi\epsilon_o a}$

T.O. 77

RR

Two charged conductors are separated by a distance d. The charges on the conductors are q and -q. If the capacitance of the system is C and the potential difference between the conductors is V, the magnitude of the charge q is

A. $\frac{C}{V}$

B. V/C

C. $\frac{V}{Cd}$

D. VC

T.O. 78

RR

Two charged parallel plate conductros each of area A carry charges q and -q. If the capacitance of the system is C, the distance of separation d between the plates is

A. $\epsilon_o AC$

B. $\frac{\epsilon_o A}{C}$

C. $\frac{\epsilon_o C}{A}$

D. $\frac{C}{\epsilon_o A}$

T.O. 80

Three capacitors of capacitance $C_1$, $C_2$ and $C_3$ are connected in series. The equivalent capacitance C which could replace the combination of $C_1$, $C_2$, and $C_3$ is

A. $\frac{C_1 C_2 C_3}{C_1 + C_2 + C_3}$

B. $\frac{C_1 C_2 C_3}{C_1 C_2 + C_2 C_3 + C_3 C_1}$

C. $\frac{C_1 + C_2 + C_3}{3}$

D. $C_1 + C_2 + C_3$

T.O. 81 RR

The work required W to charge a capacitor of capacitance C to a potential difference V is:

A. $\frac{1}{2} VC^2$

B. $\frac{1}{2} CV^2$

C. $VC^2$

D. $CV^2$

T.O. 82

Two identical capacitors, each with the same charge of Q and potential V are connected in parallel. Their combined capacitance may be expressed by:

A. $2 Q/V$

B. $Q/2V$

C. $2 QV$

D. $\frac{QV}{2}$

T.O. 83 CR

A vacuum capacitor of capacitance C is connected to a battery of voltage V. After the capacitor is charged, it is disconnected from the battery and immersed in a liquid of dielectric constant $\kappa$. If a voltmeter is now connected across the capacitor, the potential difference $V_d$ it reads is

A. 0

B. equal to V

C. is less than V

D. is greater than V

T.O. 84

Connecting a source of potential difference causes a current to flow in a conductor

A. by absorbing the "dormat" electrons in the conductor

B. by setting up an electric field within the conductor to which the electrons respond

C. since the conductor forms a path which allows the current to "escape" from the source of potential difference

D. by contributing the electrons which flow as the current throug- the conductor

T.O. 85 CR

The resistivity, $\rho$, of a conducting material is defined as the ratio of the electirc intensity, E, to the current density, j. Which one of the following is also an expression for $\rho$? ($v$ = potential, $\ell$ = length, A = cross-sectional area, $i$ = current, R = resistance)

A. $\rho = \frac{V i \ell}{A}$

B. $\rho = R \frac{\ell}{A}$

C. $\rho = \frac{VA}{i\ell}$

D. $\rho = \frac{Vi}{R\ell}$

T.O. 86

Ohm's law may be applied

A. universally to every circuit

B. only to circuits where the resistance is independent of the current and the voltage applied

C. only to circuits where the resistance is dependent on the current and voltage applied

D. only to circuits where the current and voltage are kept constant

T.O. 87

Which of the following can be a seat of emf in a circuit?

A. resistor

B. storage battery

C. switch

D. coil or solenoid

T.O. 88

Which one of the following is a correct expression for joule heating of a resistor R by a current $i$?

A. $\frac{dU}{dt} = iR$

B. $\frac{dU}{dt} = i^2R$

C. $\frac{dU}{dt} = iR^2$

D. $\frac{dU}{dt} = i^2R^2$

T.O. 89

Which of the following expresses the rate of heat loss from a circuit of known current $i$ and voltage V?

A. $\frac{dU}{dt} = iV$

B. $\frac{dU}{dt} = i^2V$

C. $\frac{dU}{dt} = iV^2$

D. $\frac{dU}{dt} = i/V$

T.O. 90

RR

In a single loop resistive circuit where $\varepsilon$ is the source emf, R is the circuit resistance and r is the internal source resistance, which equation expresses the current in the loop?

A. $\frac{\varepsilon}{r + R}$

B. $\frac{\varepsilon}{rR}$

C. $\frac{r + R}{\varepsilon}$

D. $\frac{rR}{\varepsilon}$

T.O. 91

In a series circuit with one seat of emf

A. the current is the same throughout the circuit.

B. the current differs through each resistor according to Ohm's law.

C. the voltage drop across each resistor is the same throughout the circuit.

D. both the current and the voltage drops at each resistor differ according to Ohm's law.

T.O. 92

Kirchoff's first rule of electric networks states that the sum of all currents at a branch point must be zero. This rule is implied by the conservation of:

A. momentum

B. voltage

C. charge

D. energy

T.O. 93

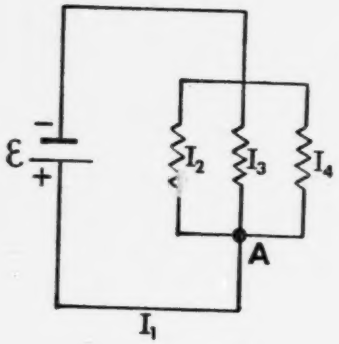
Which of the following equations correctly describes the current(s) at point A in the circuit?

A. $I_1 + I_2 + I_3 + I_4 = 0$

B. $I_1 - I_2 - I_3 - I_4 = 0$

C. $-I_1 - I_2 + I_3 + I_4 = 0$

D. $-I_1 - I_2 - I_3 + I_4 = 0$



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T.O. 94 RR

An ammeter is used to measure

A. current

B. voltage

C. capacitance

D. resistance

---

T.O. 95 CR

A voltmeter is a galvanometer with a high resistance in series with a coil and the combination is placed in parallel with the circuit. This causes:

A. an increase of current, proportinate to the meter's resistance to flow to accomodate the voltmeter in the circuit.

B. a decrease of current, proportionate to the meter's resistance, to flow to minimize "losses" in the meter.

C. a negligible current to flow through the meter to minimize its effect in the circuit.

D. virtually all of the current to flow through the meter in order to measure all of the voltage.

T.O. 96

A device used to accurately determine the value of an unknown resistance by comparing it with a known resistance is known as the:

A. Wheatstone bridge

B. Joule's apparatus

C. ohmmeter

D. potentiometer

---

T.O. 97

RI

The lines of magnetic induction are drawn so that

A. a normal to a line of induction at any point gives the direction of $\vec{B}$ field at that point

B. a tangent to a line of induction at any point gives the direction of $\vec{B}$ field at that point

C. a line drawn making an angle of 45° to the tangent to a line of induction at any point gives the direction of $\vec{B}$ field at that point

D. to obtain information regarding the magnitude of the $\vec{B}$ field only

---

T.O. 98

CR

An electron and a proton are released at the origin of a coordinate system with identical velocity $\vec{V} = V_o\hat{i}$. A uniform magnetic field $\vec{B} = B_o\hat{k}$ exists throughout the region. The electron and the proton are deflected in

A. positive y-direction and negative y-direction respectively

B. negative y-direction and positive y-direction respectively

C. positive z-direction and negative z-direction respectively

D. negative z-direction and positive z-direction respectively

T.O. 99

CR

A cube of side a is placed in a uniform magnetic field of magnitude B. The magnetic flux through the surface of the cube is

A. zero

B. 8aB

C. 4aB

D. $Ba^3$

---

T.O. 100

RR

A charge q enters a magnetic field of magnitude B with speed v and $\vec{v}$ and $\vec{B}$ are parallel to each other. The magnetic force on the charge is

A. zero

B. qvB

C. $q \frac{v}{B}$

D. $q \frac{B}{v}$

---

T.O. 101

RR

The angle of declination measures the deviation of the horizontal component of the Earth's magnetic field from true

A. east

B. west

C. south

D. north

T.O. 102 CU

A conducting wire of length ℓ which carries a current $i$ in the positive x-direction is brought into a uniform magnetic field $\vec{B} = Bj$. The magnitude of the magnetic force on the wire is

A. zero

B. $B\ell$

C. $i\ell$

D. $iB\ell$

T.O. 103 CR

A rectangular loop of wire of sides a and b carrying a current $i$ lies in the x-y plane. If a uniform magnetic field $\vec{B} = B_1\hat{i} + B_2\hat{k}$ exits throughout the region, the magnitude of the torque acting on the loop is

A. $iab\ B_2$

B. $iab(B_1 + B_2)$

C. $iab\ B_1$

D. 0

T.O. 104 RR

When a current $i$ passes through a galvanometer, the torque on the coil is

A. proportional to the area of the coil

B. proportional to the square of the area of the coil

C. proportional inversely to the area of the coil

D. independent of the area of the coil

T.O. 105

RR

The instantaneous torque acting on a coil of magnetic moment $\vec{\mu}$ placed in a uniform magnetic field $\vec{B}$ is given by

A. $\tau = \vec{\mu}\cdot\vec{B}$

B. $\vec{\tau} = (\vec{\mu} \times \vec{B})$

C. $\tau = (\vec{\mu}\cdot\vec{B})^2$

D. $\vec{\tau} = (\vec{\mu}\cdot\vec{\mu})\vec{B}$

T.O. 106

CR

A proton is positively charged ($q_p = |q_e|$) and $m_p = 1836\ m_e$. A proton and an electron released in the plane of the paper where a uniform magnetic field exists and is directed perpendicularly into the plane of the paper. If the electron is released with a speed three times the speed of the proton, the radius of the electron's orbit is approximately

A. three times larger than the radius of the proton's orbit

B. three times smaller than the radius of the proton's orbit

C. the same as that of the proton's orbit

D. six hundred times smaller than the radius of the proton's orbit

T.O. 1C7

RR

An infinitely long straight conductor carrying a current $i$ coincides with the x-axis. The direction of the current is from $-\infty$ to $+\infty$. The direction of the magnetic field at a point (o, a, o) is in the

A. positive z-direction

B. negative z-direction

C. positive x-direction

D. negative x-direction

T.O. 108

CR

Two infinitely long thin concentric conductors of radii $R_1$ and $R_2$ $(R_1 < R_2)$ carry equal and oppositely directed currents of magnitude $i$. The magnitude of the magnetic field at a point distant $d > R_2$ is

A. 0

B. $\frac{\mu_o i}{2\pi d}$

C. $\frac{\mu_o i}{2\pi(R_2 - R_1)}$

D. $\frac{\mu_o i}{2\pi(R_2{}^2 - R_1{}^2)}$

T.O. 109

PS

An infinitely long cylindrical wire of radius R carries a current I uniformly distributed over its cross section. The magnitude of the magnetic field B at a point inside the wire distant $r < R$ from the center of the wire is

A. proportional to $\frac{1}{r}$

B. proportional to $\frac{1}{r2}$

C. proportional to r

D. proportional to $r^2$

T.O. 110

CR

Two current-carrying conductors are placed at distance d parallel to one another. The currents in the conductors have magnitude $i_1$ and $i_2$ and are in opposite direction. The force on one conductor due to the other is

A. repulsive, of unequal magnitude

B. attractive, of equal magnitude

C. repulsive, of equal magnitude

D. attractive, of unequal magnitude

T.O. 111

CU

In mks system of units, the unit of electric current the ampere is defined

A. using the concept of electric charge on an electron

B. using the concept of electric charge on a proton

C. using the concept of forces of attraction between long parallel current-carrying wires

D. using the concept of amount of electric charge crossing a given area per unit of time

T.O. 112

CU

For an ideal solenoid of length $\ell$ and radius R which has n turns per unit length and current $i$, the field outside of the solenoid is

A. proportional to n only

B. zero

C. proportional to $i$ only

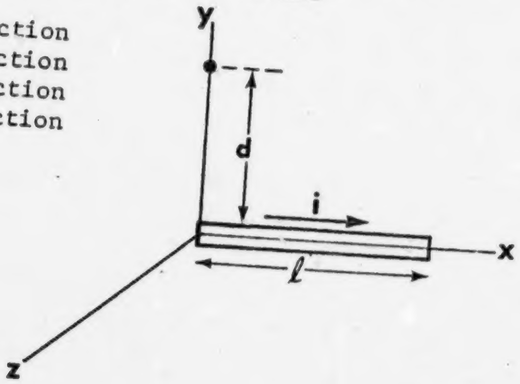
D. proportional to both $i$ and n

T.O. 113

RR

The direction of the magnetic field $\vec{B}$ due to a current-carrying conductor of length $\ell$ at a point distant $\underline{d}$ on the y-axis as shown in the diagram is in the

A. positive z direction
B. negative z direction
C. positive y direction
D. negative y direction



A rectangular coil of area A is initially located in the vertical plane i.e. y-z plane and a uniform megnetic field $\vec{B} = B_0\hat{j}$ exists throughout the region. If the loop is brought from its initial position to the honizontal position i.e. x-z plane in a time interval $\Delta t$, the magnitude of the average emf $\bar{\varepsilon}$ induced in the coil is

A. $AB_0\Delta t$

. B. $\frac{AB_0}{\Delta t}$

C. 0

D. $\frac{B_0}{A\Delta t}$

T.O. 115

CR

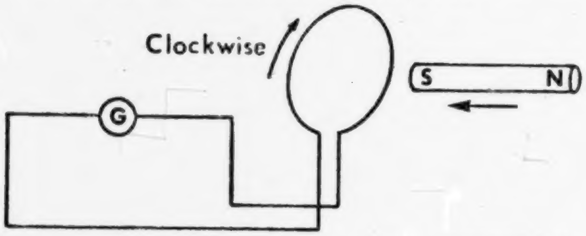
If the south pole of the magnet in the diagram below is moving toward the loop, the current in the loop is

A. increasing in the counter clockwise direction

B. in the clockwise direction

C. unchanged

D. in the counter clockwise direction



CR

T.O. 116

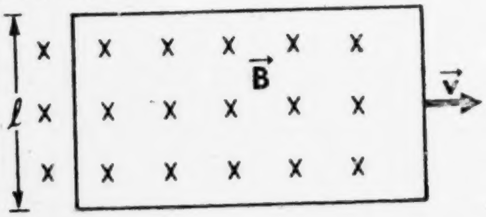
A closed conducting loop as shown in the diagram is being moved to the right at a constant speed v. If the loop has a total resistance R, then the current $i$ in the loop is

A. $B\ell v/R$, counter clockwise

B. $B\ell vR$, clockwise

C. $B\ell v/R$, clockwise

D. $B\ell v$, counter clockwise.



T.O. 117

RR

The defining equation for an inductance L of a coil in terms of induced emf $\varepsilon$ and a time varying current $i$ is

A. $L = -\varepsilon \frac{di}{dt}$

B. $L = -\varepsilon/di/dt$

C. $L = -\frac{di}{dt}/\varepsilon$

D. $L = \varepsilon \frac{di}{dt}$

T.O. 118

RR

The inductance L of a long solenoid having n turns per unit length, length $\ell$ and cross-sectional area A is proportional to

A. $n^2$

B. $n$

C. $1/n$

D. $1/n^2$

T.O. 119

CR

An emf is applied to a coil with a self inductance L and a resistance R causing the current to increase. The power delivered by the emf to the coil is

A. $i^2R + Li \frac{di}{dt}$

B. $i^2R$

C. $i^2R - Li \frac{di}{dt}$

D. $- Li \frac{di}{dt}$

T.O. 120

CR

The magnetic energy per unit volume stored in the magnetic field in a long solenoid of length $\ell$ and cross section A is equal to

A. $\frac{1}{2}\mu_o i^2 n$

B. $\mu_o i n$

C. $\frac{1}{2}\mu_o i^2 n^2$

D. $\frac{1}{2}\mu_o n^2$

T.O. 121

CR

A resistor of resistance R and a capacitor of capacitance C are connected in series with a seat of emf $\varepsilon$. The potential drop across the capacitor at the time t after the connection is made is

A. $\varepsilon\left(1 - e^{-t/RC}\right)$

B. $\varepsilon\, e^{-t/RC}$

C. $\varepsilon\left(e^{-t/RC} - 1\right)$

D. 0

T.O. 122

RR

In a circuit consisting of a capacitance, C, a resistance, R, and a seat of emf, $\varepsilon$, the capacitative time constant of the circuit is given by

A. R/C

B. RC

C. $\varepsilon/R$

D. $C\varepsilon$

T.O. 123 CU

The seat of enf ε is removed from an RC circuit with fully charged capacitor C. The amount of charge remaining on the plates of the capacitor after a duration RC will be

A. zero.

B. .63 of equilibrium charge.

C. .50 of equilibrium charge

D. .37 of equilibrium charge

---

T.O. 124 RR

In a circuit consisting of an inductance, L, a resistance, R, and a seat of emf, ε , the inductive time constant is given by:

A. RL

B. $\frac{\varepsilon}{R}$

C. L/R

D. $\frac{\varepsilon}{R}$

---

T.O. 125 RR

A resistor of resistance R and a inductor of inductance L are connected in series with a source of emf ε . After the equilibrium is reached the source of emf is removed. The current in the circuit at the time R/L after the source of emf is removed is

A. 0

B. $.37 \frac{\varepsilon}{R}$

C. $.50 \frac{\varepsilon}{R}$

D. $.63 \frac{\varepsilon}{R}$

In the current-decaying equation for an RL circuit, the percentage of the initial current after a period of one time constant from the time when the applied emf is removed is

A. Zero

B. 37%

C. 50%

D. 63%

Xi

T.O. 49

CU

Two charges $q_1$ and $q_2$ experience an attractive force between them. Charge $q_1 = 2q_2$. The force on $q_1$ is $\vec{F}_1$ and that on $q_2$ is $\vec{F}_2$. Which statement is correct?

A. $\vec{F}_1 = \vec{F}_2$

B. $|\vec{F}_1| > |\vec{F}_2|$

C. $|\vec{F}_1| < |\vec{F}_2|$

D. $\vec{F}_1 = -\vec{F}_2$

T.O. 50

RR

A glass rod rubbed with silk and a rubbed with fur are designated

A. both positive

B. both negative

C. negative and positive respectively

D. positive and negative respectively

T.O. 51

CU

When a glass rod is rubbed with silk a certain quantity of positive charge appears on the glass rod. The total quantity of charge on the glass rod and the silk cloth

A. becomes more negative

B. becomes more positive

C. remains unchanged

D. none of the above

T.O. 52 CR

A particle of mass m and charge q is placed in an electric field $\vec{E} = E\,\hat{j}$. Neglecting gravitational effect, the acceleration of the particle is

A. $\frac{qE}{m}\hat{j}$

B. $mqE\,\hat{j}$

C. $\frac{m}{qE}\hat{j}$

D. $\frac{E}{qm}\hat{j}$

T.O. 53

Two identical point charges q are placed at (0, 0) and (a,0) in a given x-y coordinate system. The electric field $\vec{E}$ at 2a,0) due to the two charges is

A. 0

B. $\frac{5q\hat{i}}{16\pi\epsilon_0 a^2}$

C. $\frac{q\hat{i}}{4\pi\epsilon_0 a^2}$

D. $\frac{q\hat{i}}{2\pi\epsilon_0 a^2}$

T.O. 54

RR

Two uncharged pith balls P and Q are touched by a negatively charged glass rod and a positively charged rubber rod respectively. If the pith balls were not in contact before being touched by the respective rods, what happens immediately afterwards?

A. The pith balls move away from each other

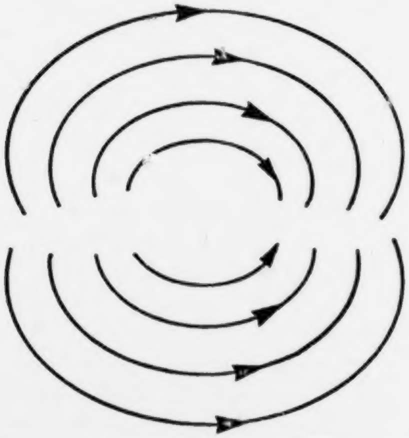
B. The pith balls are not effected by the presence of the rod.

C. The pith balls move toward each other

D. The pith balls oscillate about their original positions.

T. O. 55 RR

A portion of an electric field line diagram has been erased. Of the four choices given below, which is most likely responsible for the illustrated field?



A. a positive and a negative charge

B. two positive charges

C. two negative charges

D. a positive charge

---

T.O. 56 CR

A dipole of dipole moment $\vec{P} = 2qa\ \hat{i}$ is placed in a uniform electric field $\vec{E} = E_o\ \hat{i}$. The magnitude of the force acting on the dipole is

A. $qa\ E_o$

B. $2qa\ E_o$

C. 0

D. $(4q^2a^2 + E_o{}^2)\ 1/2$

---

T.O. 60

RR

A nonconducting infinite sheet of charge has surface charge density σ (charge per unit area). The magnitude of electric field E at a distance r in front of the infinite plane is

A. $\frac{\sigma}{4\pi\varepsilon_o r^2}$

B. $\frac{\sigma}{2\pi\varepsilon_o r}$

C. $\frac{\sigma}{2\pi\varepsilon_o}$

D. $\frac{\sigma}{2\varepsilon_o}$

T.O. 61

CU

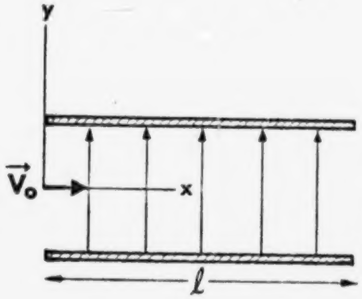
A uniform electric field $\vec{E} = E_o \hat{j}$ exists between two charged plates of length $\ell$ as shown below. A particle of mass m and charge q enters the region of electric field at the origin with velocity $\vec{v} = v_o \hat{i}$. The x-component of the velocity $v_x$ of the particle as it leaves the field region is

A. $v_o$

B. $\frac{qE_o\ell}{m\,v_o}$

C. $\frac{q\,E_o\,\ell^2}{m\,v_o}$

D. 0



T.O. 62

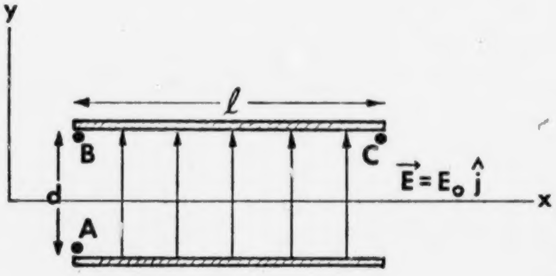
Two parallel plates of length $\ell$ are separated by a distance d. A uniform electric field $\vec{E}=E_o\hat{j}$ exists between the plates. If a charge q is moved from a point A to a point B and finally to a point C, the total work done is

A. $q\,E_o\,d$

B. $\frac{q\,E_o}{d}$

C. 0

D. $q\,E_o\ell d$



T.O. 63

CR

A particle of charge q is moved from $x = x_1$ to $x = x_2$ in an electric field

$$\vec{E}(x) = \frac{1}{x^2}\hat{i}$$

The work done is

A. $q\left(\frac{1}{x_1} - \frac{1}{x_2}\right)$

B. $q\left(\frac{1}{x_2} - \frac{1}{x_1}\right)$

C. 0

D. $q\left(\frac{1}{x_2} + \frac{1}{x_1}\right)$

T.O. 64

RR

In calculating electric flux through a surface due to an electric field one needs to know the direction of the surface area vector. The direction of the surface area vector is difined as:

A. the direction of a line tangent to the surface at the point in question

B. the "average" direction of the lines emanating from the surface

C. the direction of a vector perpendicular to a surface

D. a surface cannot have a direction

T.O. 65

CR

A surface of area $\vec{S}$ is coincident with y-z plane. If a uniform electric field $\vec{E} = E_o\hat{i} + E_1\hat{k}$ exists throughout the space in consideration, the electric flux through the surface is

A. $SE_o$

B. $SE_1$

C. $S(E_o + E_1)$

D. $SE_o\hat{i} + SE_1\hat{k}$

T.O. 66

CU

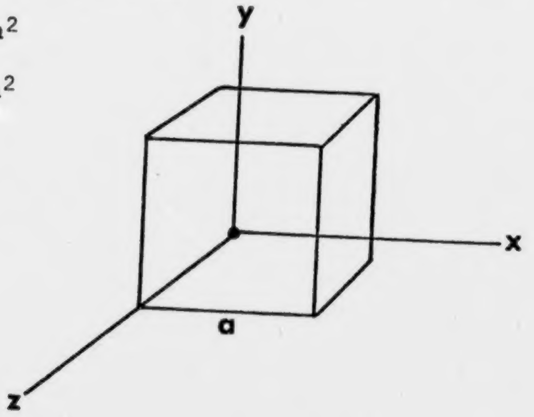
$\vec{A}$ cube of side a is placed in an uniform electric field $\vec{E} = E_o(\hat{i} + \hat{j})$ as shown in the diagram. The total electric flux through the cubical surface is

A. $2\sqrt{2}\,E_oa^2$

B. $6\sqrt{2}\,E_oa^2$

C. $3\sqrt{2}\,a^3$

D. zero



T.O. 67

RR

The relationship between electric flux through a closed surface $\oint \vec{E}\cdot d\vec{S}$ and the net charge q enclosed within the surface is given by

A. $\oint \vec{E}\cdot d\vec{S} = q\varepsilon_o$

B. $\oint \vec{E}\cdot d\vec{S} = \frac{\varepsilon_o}{q}$

C. $\oint \vec{E}\cdot d\vec{S} = \frac{q}{\varepsilon_o}$

D. $\oint \vec{E}\cdot d\vec{S} = \frac{q}{4\pi\varepsilon_o}$

---

T.O. 68

CR

Two concentric spherical conductors of radii a and b ($b > a$) carry charges q and $-q$ respectively. The magnitude of electric field for $r > b$ is

A. $\frac{q}{4\pi\varepsilon_o r^2}$

B. $\frac{q}{4\pi\varepsilon_o}\left(\frac{1}{a^2} - \frac{1}{b^2}\right)$

C. zero

D. $\frac{q}{4\pi\varepsilon_o a^2}$

---

T.O. 69

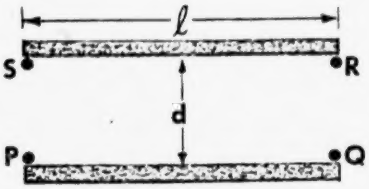
PS

A spherical nonconductor of radius 2.0 meters carries a charge q which is uniformly distributed throughout its volume. The magnitude of electric field at points 4.0 meters from the center of the sphere is $E = \frac{1}{4\pi\varepsilon_o}$ nt/coul. The charge q is

A. 12 coul
B. 4 coul
C. 16 coul
D. 2 coul

T.O. 71 CR

Two parallel plates A and B of length $\ell$ are separated by distance d and are maintained at electric potentials $V_A$ and $V_B$ respectively If a charge q is moved from points P to Q to R to S to P, the total work done is



A. $2qd(V_B - V_A)$

B. $2q(d + \ell)\ (V_B - V_A)$

C. zero

D. $2q\ell(V_B - V_A)$

T.O. 72

RR

A point charge which produces the potential $V = \frac{-q}{4\pi\varepsilon_o r}$ at a distance r from it carries the charge of

A. $+q$

B. $-q$

C. $\frac{q}{4\pi\varepsilon_o}$

D. $\frac{-q}{4\pi\varepsilon_o}$

T.O. 73 CR

Two identical charges each of magnitude q are separated by a distance 2a. The electric potential at the midpoint of the line joining the two charges is

A. 0

B. $\frac{2q}{4\pi\varepsilon_o a^2}$

C. $\frac{2q}{4\pi\varepsilon_o a}$

D. $\frac{q}{8\pi\varepsilon_o a}$

T.O. 74

CR

A spherical nonconductor of radius R carries a charge q which is uniformly distributed throughout its volume. The electric potential at point $r > R$ is

A. 0

B. $\frac{q}{4\pi\varepsilon_o}\left(\frac{1}{R^2} - \frac{1}{r^2}\right)$

C. $\frac{q}{4\pi\varepsilon_o r^2}$

D. $\frac{q}{4\pi\varepsilon_o r}$

T.O. 75

CR

The electric potential a point due to certain charge distribution is $V = \frac{1}{4\pi\varepsilon_o}\frac{q}{x^2}$ . The magnitude of y-component of electric field $E_y$ is

A. $\frac{1}{2\pi\varepsilon_o}\frac{q}{x^3}$

B. $-\frac{1}{4\pi\varepsilon_o}\frac{q}{x}$

C. $\frac{1}{4\pi\varepsilon_o}\frac{q}{x^2}$

D. zero

T.O. 76

CR

Two charges q and 3q are placed a distance a apart. The electric potential energy of the system is

A. $\frac{4q}{4\pi\epsilon_o a}$

B. $\frac{4q^2}{4\pi\epsilon_o a}$

C. $\frac{3q^2}{4\pi\epsilon_o a}$

D. $\frac{9q^2}{4\pi\epsilon_o a}$

T.O. 77

RR

Two charged conductors are separated by distance d. The charges on the conductors are +q and -q. The potential difference between the conductors is V. The capacitance C of the system is

A. V/q

B. qV

C. q/V

D. 1/qV

T.O. 78

RR

Two charged parallel plate conductors, each of area A are separated by a distance d. If the charges on the plates are q and -q, the capacitance C of the system is proportional to

A. $\frac{A}{d}$

B. $\frac{d}{A}$

C. $\frac{A^2}{d}$

D. $\frac{d^2}{A}$

T.O. 80

RR

Three capacitors of capacitance $C_1$, $C_2$ and $C_3$ are connected in parallel. The equivalent capacitance C which could replace the combination of $C_1$, $C_2$, and $C_3$ is

A. $\frac{C_1C_2C_3}{C_1 + C_2 + C_3}$

B. $\frac{C_1C_2C_3}{C_1C_2 + C_2C_3 + C_3C_1}$

C. $\frac{C_1 + C_2 + C_3}{3}$

D. $C_1 + C_2 + C_3$

T.O. 81 CR

The work required W to charge a capacitor of capacitence C to produce a final charge of magnitude Q on each plate is

A. $\frac{1}{2} CQ^2$

B. $\frac{1}{2} C^2Q$

C. $\frac{1}{2} \frac{Q^2}{C}$

D. $\frac{1}{2} \frac{C^2}{Q}$

T.O. 82 CR

Two capacitors having capacitances $C_1$ and $C_2$ are connected in series across a source of emf $\varepsilon$. After the capacitors are charged, the charges on capacitors $C_1$ and $C_2$ are

A. $\varepsilon C_1$ and $\varepsilon C_2$ respectively

B. both $\varepsilon(C_1 + C_2)$

C. $\varepsilon/C_1$ and $\varepsilon/C_2$ respectively

D. both $\frac{\varepsilon \, C_1 C_2}{C_1 + C_2}$

T.O. 83 CR

A vacuum capacitor of capacitance C is connected to a battery of voltage V. After the capacitor is charged, it is disconnected from the battery and immersed in a liquid a dielectric constant $\kappa$. The expression for the potential difference with the dielectric $V_d$ is

A. $V_d = \frac{V}{\kappa}$

B. $V_d = V\kappa$

C. $V_d = V \frac{\epsilon_o}{\kappa}$

D. $V_d = V \frac{\kappa}{\epsilon_o}$

T.O. 84

No current is flowing in an isolated conductor. This is so because:

A. the electrons are motionless until a potential difference sets them in motion

B. the electrons are motionless unitl acted upon by a magnetic field

C. the constant random motion of the electrons i such that the net directed motion in any direction is zero without a source of potential difference

D. although electrons are in constant motion producing a continuous current, the current has no energy without a source of potential differ-

T.O. 85 RR

Resistivity, $\rho$ , of a conducting material is expressed in units of ohm-meter. If $\ell$ is the length of a conductor whose cross-sectional area is A, which one of the following expressions correctly relates resistance,R, to resistivity?

A. $R = \rho\frac{A}{\ell}$

B. $R = \rho\frac{\ell}{A}$

C. $R = \rho\ell$

D. $R = \rho A$

T.O. 86

In a non-linear circuit, the equation $P = V/i$ is:

A. always true by definition
B. never true
C. true for a unique voltage
D. true for a unique current

T.O. 87

A seat of emf is a term used to describe:

A. a place in a circuit where emf's congregate.

B. an area of low emf density in a circuit.

C. a low electrical potential in a circuit.

D. any source of emf.

RR

T.O. 88

In a circuit where the resistance of the elements is independent of the current, the heat developed

A. is directly proportional to current.

B. is proportional to current squared.

C. is inversely proportional to current.

D. is independent of the current.

CR

T.O. 89

Which of the following expresses the rate of heat loss from a circuit of known resistance R and voltage V?

A. $VR$

B. $V/R$

C. $V^2/R$

D. $V^2R$

T.O. 90

In a closed single loop circuit, where r is the internal resistance of the source, R is the circuit resistance, $i$ is current and $\varepsilon$ is the emf of the source, which is an appropriate loop equation?

A. $-\varepsilon + ir = 0$

B. $\varepsilon + ir + iR = 0$

C. $\varepsilon - ir - iR = 0$

D. $\varepsilon + ir - iR = 0$

T.O. 91

In a parallel circuit with one of emf:

A. the voltage divides amongst the branch loops while the current is the same in all loops.

B. the current divides amongst the branch loops while the voltage drop across the loops is the same.

C. both the current and voltage divide in proportion to the resistance of the loops.

D. both the current and voltage divide in inverse proportion to the resistance of the loops.

T.O. 92

Kirchoff's second rule of electric networks states that the sum of all changes of potential in a circuit must be zero. This rule is implied by the conservation of:

A. momentum

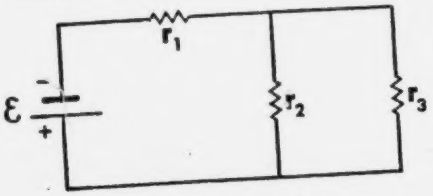
B. voltage

C. charge

D. energy

T.O. 93

The current through resistances $r_1$, $r_2$, and $r_3$ are respectively, $i_1$, $i_2$, $i_3$. Which is the correct expression for the voltage changes around the circuit?



A. $\varepsilon + i_1r_1 + i_1r_2 + i_1r_3 = 0$

B. $\varepsilon + i_1r_1 + i_2r_2 = 0$

C. $\varepsilon - i_1r_1 - i_1r_2 - i_1r_3 = 0$

D. $\varepsilon - i_1r_1 - i_2r_2 = 0$

T.O. 94 CU

The resistance of the ammeter should be _________ compared to other resistance in the circuit.

A. large

B. small

C. about the same

D. much larger

T.O. 95

A voltmeter is a galvanometer with a high resistance

A. in series with the meter and the combination (resistance-meter) is connected in series in the circuit.

B. in parallel with the meter and the combination (resistance-meter) is connected in series in the circuit.

C. in series with the meter and the combination (resistance-meter) is connected in parallel to the circuit branch.

D. in parallel with the meter and the combination (resistance-meter) is connected in parallel to the circuit branch.

T.O. 96

The Wheatstone bridge accurately determines the value of an unknown resistance by:

A. balancing its effect with that of a known resistance.

B. measuring the current through the resistance at a known voltage.

C. by elimination of the unknown and substitution of a known resistance in the circuit.

D. by bridging across the unknown resistance and measuring the results of its elimination from the circuit.

T.O. 97 RR

In the absence of gravitational and electric fields, if a particle of charge q and mass m is projected with a velocity $\vec{v}$ and observed no change in the particle's velocity, then we can say that

A. if there is a magnetic field it must be uniform

B. if there is a magnetic field it must be parallel to $\vec{v}$

C. if there is a magnetic field, it must be directed perpendicular to $\vec{v}$

D. if there is a magnetic field, it must be directed 45° to $\vec{v}$

T.O. 98 CU

A proton (charge e and mass $m_p$) moving with a velocity $\vec{V} = V_o\hat{i}$ is found to experience a force $\vec{F} = F_o\hat{j}$ at a point due only to the presence of magnetic field. The magnitude of the magnetic field B does not depend upon

A. e

B. $F_o$

C. $m_p$

D. $V_o$

T.O. 99

CR

A uniform magnetic field of magnitude B makes an angle of 30° with a plane surface of area A. The magnetic flux $\phi_B$ through the surface is

A. zero

B. BA

C. BA cos30°

D. BA cos60°

---

T.O. 100

RR

A charge q enters a magnetic field of magnitude B with speed v at an angle $\theta$. The magnitude of the magnetic force on the charge is

A. zero

B. qvB

C. $qvB\cos\theta$

D. $qvB\sin\theta$

---

T.O. 101

RR

In general, the angle of inclination of dip measures the angle between the Earth's magnetic field and

A. true north

B. true south

C. the horizontal

D. the vertical

T.O. 102

CU

A conducting wire of length $\ell$ which carries a current $i$ is brought into a uniform magnetic field. The angle between the current and the magnetic field is 30°. The magnitude of the magnetic force on the wire is

A. $i\ell B \cos 30°$

B. $i\ell B$

C. zero

D. $i\ell B \sin 30°$

T.O. 103

CR

A rectangular loop of wire of sides a and b carrying a current $i$ lies in the x-y plane. If a uniform magnetic field $\vec{B} = B_o\hat{k}$ exists throughout the region, the magnitude of the torque acting on the loop is

A. $iab\, B_o$

B. 0

C. $iB_o(a + b)$

D. $\dfrac{B_o\, ab}{i}$

T.O. 104

RR

When a current $i$ passes through a galvanometer, the torque on the coil is proportional to

A. $i$

B. $i^2$

C. $1/i$

D. $1/i^2$

T.O. 105

RR

In a simple DC motor a coil of n turns, area A carries a current $i$. The coil is placed in a uniform magnetic field $\vec{B}$. The instantaneous torque on the coil is given by

A. $\tau = ni(\vec{A}\cdot\vec{B})$

B. $\vec{\tau} = ni(\vec{A} \times \vec{B})$

C. $\tau = \frac{\vec{A}\cdot\vec{B}}{ni}$

D. $\vec{\tau} = \frac{\vec{A} \times \vec{B}}{ni}$

T.O. 106

CR

A proton is positively charged ($q_p = |q_e|$) and $m_p = 1836\ m_e$. A proton and an electron are released with its velocity in the plane of the paper, there being a uniform magnetic field directed perpendicularly into the plane of the paper. If the proton and the electron are released with equal kinetic energies, the electron's orbit is

A. larger than the proton's orbit

B. smaller than the proton's orbit

C. the same size as the proton's orbit

D. independent of its kinetic energy

T.O. 107

RR

An infinitely long straight conductor carrying a current $i$ coincides with the x-axis. The direction of the current is from $+\infty$ to $-\infty$. The direction of the magnetic field at a point (o, a, o) is in the

A. positive z-direction

B. negative z-direction

C. postivie x-direction

D. negative x-direction

T.O. 108

Two infinitely long thin concentric conductors of radii $R_1$ and $R_2$ ($R_2 > R_1$) carry equal currents $i$ and in the same direction. The magnitude of the magnetic field at a point distant $d > R_2$ is

A. 0

B. $\frac{\mu_o i}{2\pi d}$

C. $\frac{\mu_o i}{\pi d}$

D. $\frac{\mu_o i}{4\pi d}$

---

T.O. 109

CU

An infinitely long conducting cylindrical shell of inner radius $R_1$ and outer radius $R_2$ carries a current I uniformly distributed over its cross section. The magnitude of the magnetic field B at a point $r < R_1$ from the center of the wire is

A. $\frac{\mu_o I}{2\pi r}$

B. 0

C. $\frac{\mu_o I}{2\pi} \frac{r}{R^2}$

D. $\frac{\mu_o I}{2\pi} \frac{r^2}{R^2}$

---

T.O. 110

CR

Two parallel current-carrying conductors are placed a distance d apart. The conductors carry the currents $I_1$ and $I_2$ in opposite directions. The force on conductor 2 due to conductor 1 is

A. proportional to d

B. proportional to 1/d

C. proportional to $d^2$

D. proportional to $1/d^2$

T.O. 111 RR

In mks system of units electric current is measured in

- A. volts
- B. coloumbs
- C. ohms
- D. amperes

T.O. 112 RR

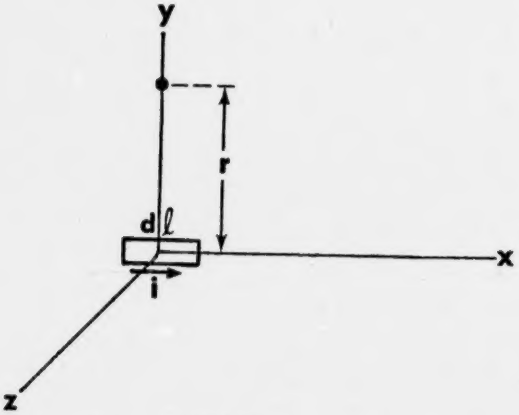
An ideal solenoid of length ℓ and radius R has n turns per unit length and is carrying current *i*. The magnetic field inside the solenoid is proportional to

- A. n only
- B. $n^2$
- C. both *i* and n
- D. *i* only

T.O. 113 RR

The magnitude of the magnetic field B due to a current-carrying $d\vec{\ell}$ at a point distant r on the y-axis as shown in the diagram is

- A. $\frac{\mu_o i}{4\pi} \frac{d\ell}{r^3}$
- B. $\frac{\mu_o i}{4\pi} \frac{d\ell}{r^2}$
- C. $\frac{\mu_o i}{4\pi} \frac{d\ell}{r}$
- D. $\frac{\mu_o i}{4\pi} d\ell r$



T.O. 114

PS

A rectangular coil of area A is initially located in the vertical plane, i.e., y-z plane and a uniform magnetic field $\vec{B} = -B_o\hat{k}$ exists throughout the region. If the loop is brought from its initial position to the horizontal position, i.e., x-z plane in a time interval $\Delta t$, the magnitude of the average emf $\overline{\varepsilon}$ induced in the coil is

A. $\frac{B_o}{A\,\Delta t}$

B. 0

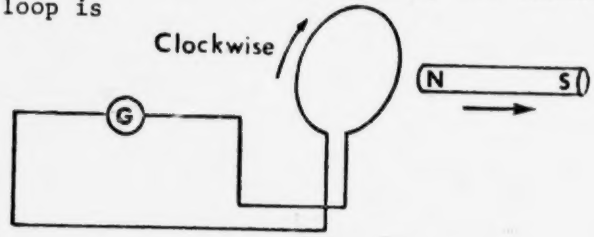
C. $A\,\frac{B_o}{\Delta t}$

D. $AB_o\Delta t$

T.O. 115

CR

If both the magnet and the loop in the diagram below is moving toward right with the same velocities, the induced current in the loop is

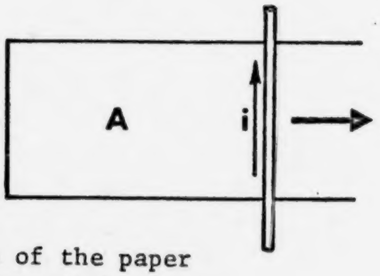


A. zero
B. decreasing in the clockwise direction
C. increasing in the counter clockwise direction
D. decreasing in the counter clockwise direction

T.O. 116

CR

As in the diagram below, the movable wire is moved to the right, causing an induced current as shown. The direction of $\vec{B}$ in region A is



A. into the plane of the paper
B. out of the plane of the paper
C. to the right
D. to the left

T.O. 117 RR

The applied power required to cause a rate of current rise $di/dt$ in a coil of self-inductance L is

A. $i \frac{dL}{dt}$

B. $iL \frac{di}{dt}$

C. $i^2L \frac{di}{dt}$

D. $-i \frac{dL}{dt}$

---

T.O. 118 CR

The inductance L of a long solenoid of length $\ell$, cross-sectional area A and having N turns is

A. $\frac{\mu_o NA}{\ell}$.

B. $\frac{\mu_o N^2A}{\ell}$.

C. $\frac{\mu_o N^2A}{\ell^2}$.

D. $\frac{\mu_o NA}{\ell^2}$.

---

T.O. 119 CR

When an emf is applied to a coil with a self inductance L and a resistance R causing the current to increase. The power delivered by the emf is partly stored in the magnetic field as the magnetic energy. The rate at which the magnetic energy is being stored is

A. $- Li \frac{di}{dt}$

B. $- L \frac{di}{dt}$

C. $Li \frac{di}{dt}$

D. $L \frac{di}{dt}$

T.O. 120

RR

An inductor with inductance L and originally carring a steady-state current $i$ is allowed to discharge through a certain mechanism. What is the total energy lost?

A. $Li^2$

B. 0

C. $\frac{1}{2} Li^2$

D. $\frac{1}{2} Li$

T.O. 121

CR

A resistor of resistance R and a capacitor of capacitance C are connected in series with a seat of emf $\varepsilon$. The potential drop across the resistor at the time t after the connection is made is

A. $\varepsilon\left(1 - e^{-t/RC}\right)$

B. $\varepsilon\, e^{-t/RC}$

C. $\varepsilon\left(e^{-t/RC} - 1\right)$

D. 0

T.O. 122

CR

In a circuit consisting of a capacitor, C, a resistance, R, and a seat of emf, $\varepsilon$, the amount of charge accumulated on the plates of the capacitor after a duration RC has elapsed will be

A. 100% of the equilibrium charge

B. 63% of the equilibrium charge

C. 50% of the equilibrium charge

D. 37% of the equilibrium charge

T.O. 123 RR

A capacitor charged to a potential $\varepsilon$ begins to discharge throu
a resistor R in a circuit without a seat of emf. The initial current will be

A. zero.

B. $.37 \ \frac{\varepsilon}{R}$

C. $.63 \ \frac{\varepsilon}{R}$

D. $\frac{\varepsilon}{R}$

---

T.O. 124 RR

A circuit has inductance L, resistance R, and emf $\varepsilon$. When one time constant has elapsed after the circuit is closed, the current in the circuit is

A. $\frac{\varepsilon}{R}$

B. $.63 \ \frac{\varepsilon}{R}$

C. $.50 \ \frac{\varepsilon}{R}$

D. $.37 \ \frac{\varepsilon}{R}$

---

T.O. 125 RR

A resistor of resistance R and a inductor of inductance L are connected in series with a source of emf $\varepsilon$. After the equilibrium is reached the source of emf is removed. The current in the circuit at the time 100 R/L after the source of emf is removed approaches

A. 0

B. $.37 \ \frac{\varepsilon}{R}$

C. $.01 \ \frac{\varepsilon}{R}$

D. $.63 \ \frac{\varepsilon}{R}$

T.O. 126

RR

In an RL circuit consisting of inductance L and a resistance R, current is allowed to decay after it has reached the maximum value ε/R. The decay current in the RL circuit after time t is

A. $i = \frac{\varepsilon}{R}\left(1 - e^{-R/Lt}\right)$

B. $i = \frac{\varepsilon}{R}\left(1 - e^{-t/RL}\right)$

C. $i = \frac{\varepsilon}{R} e^{-R/Lt}$

D. $i = \frac{\varepsilon}{R} e^{-t/RL}$

OMICRON

T.O. 49

CU

Two charges A and B experience an attractive force between them. If the charge of A is doubled then,

A. only B experiences an increased pull

B. only A experiences an increased pull

C. both A and B experiences an increased pull

D. neither experience an increase since only one charge was changed.

T.O. 50

The charge developed on an insulated glass rod rubbed with a silk cloth is designated

A. positive

B. negative

C. neutral

D. none of the above

T.O. 51

CU

The principle of conservation of charge can be stated as

A. charges always appear in pairs

B. like charges repel; unlike attract

C. the quantity of work done on a charge by an externally generated field is constant

D. the quantity of charge in a closed system does not change

T.O. 52 CR

A particle of mass m and charge q is placed in an electric field and gravitational field of the earth. For the particle to be in equilibrium (dynamical), the magnitude of electric field is

A. $mgq$

B. $\frac{mg}{q}$

C. $\frac{q}{mg}$

D. $\frac{mg}{4\pi\epsilon_0 q}$

T.O. 53 PS

Two point charges 4q and -q are placed at (o,o) and (a,o) respectively in a given x-y coordinate system. The electric field $\vec{E}$ at (2a,o) due to the two charges is

A. $\frac{2q\,\hat{i}}{\pi\varepsilon_0 a^2}$

B B. $\frac{5q\,\hat{i}}{\pi\varepsilon_0 a^2}$

C. 0

D. $\frac{-2q\,\hat{i}}{\pi\varepsilon_0 a^2}$

T.O. 54 RR

Two uncharged pith balls are touched by a negatively charged glass rod. If the pith balls were in contact before being touched by the glass rod what happens immediately afterwards?

A. The pith balls remain in contact

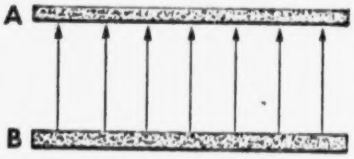
B. The pith balls move away from each other

C. The pith balls attract each other

D. The pith balls are not effected by the presence of the glass rod

T.O. 55 RR

Refer to the electric field lines drawn below. What observation can be made about the nature of charges on the plates A and B?



A. A is positively charged, B is negatively charged

B. Both A and B are positively charged

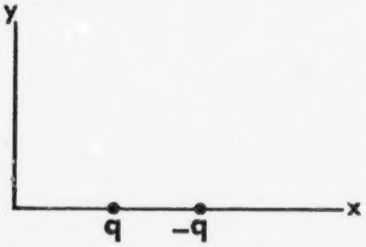
C. A is negatively charged, B is positively charged

D. Both A and B are negatively charged

---

56 RR

Two charges q and -q constitute a dipole and is placed on the x-axis as shown below. The direction of the dipole moment is



A. along the positive x-axis

B. along the negative x-axis

C. along the positive y-axis

D. along the negative y-axis

---

T.O.60 RR

A nonconducting infinite sheet coincident with y-z plane has surface charge density σ (charge per unit area). The electric field $\vec{E}$ at a point (x, o, o) in front of the plane is

A. $\frac{\sigma}{4\pi\epsilon_o a^2}\,\hat{i}$

B. $\frac{\sigma}{2\epsilon_o}\,\hat{i}$

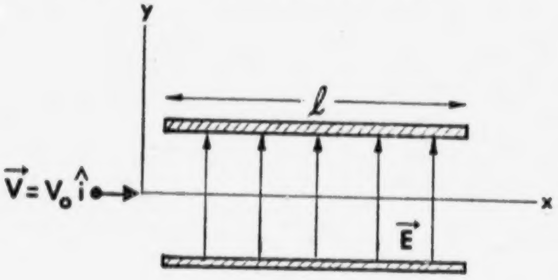
C. $\frac{-\sigma}{2\epsilon_o}\,\hat{i}$

D. $\frac{-\sigma}{2\pi\epsilon_o}\,\hat{i}$

T.O. 61

PS

A uniform electric field $\vec{E}= E_0\hat{j}$ exists between two charged parallel plates of length $\ell$ as shown below. A particle of mass m and charge q enters the region of the electric field at the origin with a velocity $v = V_0 \hat{i}$. The Y-component of the velocity $V_y$ of the particle as it leaves the field region is



A. $V_0$

B. $\frac{q\,E_0\,\ell}{m\,V_0}$

C. $\frac{q\,E_0\,\ell^2}{m\,V_0}$

D. 0

T.O. 62

CR

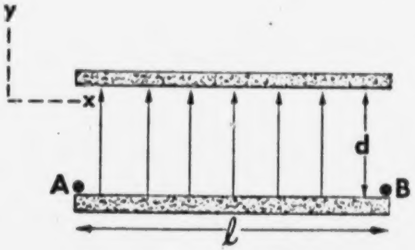
Two parallel plates of length $\ell$ are separated by distance d. A uniform electric field $\vec{E} = E_0\,\hat{j}$ exists between the plates. If a charge q is moved from point A to point B, the work done is

A. $qE_0d$

B. $qE_0\ell$

C. Zero

D. $q\,E_0\ell d$



### T.O. 63

R

A particle of charge q is moved from $x = x_1$ to $x = x_2$ in a variable electric field $\vec{E}$ (x). The work done W is

A. $q\int_{x_1}^{x_2} E\, dx$

B. $q\int_{x_1}^{x_2} \vec{E}\cdot d\vec{x}$

C. $-q\int_{x_1}^{x_2} E\, dx$

D. $-q\int_{x_1}^{x_2} \vec{E}\cdot d\vec{x}$

### T.O. 64

RR

Electric flux is a measure of

A. the field strength of a field at a unit distance from the surface

B. the number of electrons passing through a closed surface that surrounds a charge

C. the number of lines of force that cut through any hypothetical surface

D. the magnitude of the electrical force that is exerted on a unit charge placed in an electric field

### T.O. 65

CR

A surface of area S is coincident with y-z plane. If a uniform electric field $\vec{E} = E_o\ \hat{i}$ exists throughout the space in consideration, the electric flux through the surface is

A. $\frac{S}{E_o}$

B. 0

C. $SE_o\ \hat{i}$

D. $SE_o$

CU

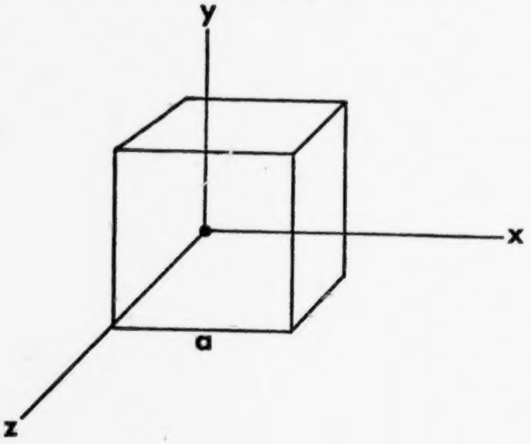
A cube of side a is placed in a uniform electric field $\vec{E} = E_o\hat{j}$ as shown in the diagram. The total electric flux through the cubical surface is

A. $a^3E_o$

B. $2\ a^2E_o$

C. $aE_o$

D. 0



T.O. 67

RR

In the equation for Gauss's law, the q term indicates

A. the given charges enclosed by the Gaussian surface

B. the net charge enclosed by the Gaussian surface

C. the net charge enclosed by the Gaussian surface and any other charges in proximity to the Gaussian surface

D. the absolute value of the net charge enclosed by the Gaussian surface

T.O. 68

CR

A spherical conductor of radius R carries charge q. The magnitude of the electric field for points r > R is

A. zero

B. $\frac{q}{4\pi\varepsilon_o r^2}$

C. $\frac{q}{4\pi\varepsilon_o}\left(\frac{1}{R^2} - \frac{1}{r^2}\right)$

D. $\frac{q}{4\pi\varepsilon_o R^2}$

T.O. 69

PS

A spherical conductor of radius 2 m carries charge q. The magnitude of the electric field E for points r = 3 m is found to be $E = \frac{1}{4\pi\varepsilon_o}$ nt/coul. The charge q is

A. 9 coul

B. 3 coul

C. $9 \times 10^9$ coul

D. 4 coul

T.O. 71

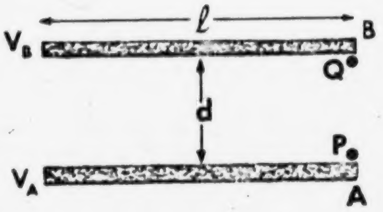
Two parallel plates A and B of length $\ell$ are separated by a distance d and are maintained at electric potentials $V_A$ and $V_B$ respectively. If a charge q is moved from a point P to a point Q, the work done is

A. $q\ell(V_B - V_A)$

B. $q(V_B - V_A)$

C. $qd(V_B - V_A)$

D. $\frac{q}{d}(V_B - V_A)$



T.O. 72

RI

The value of an isolated positive point charge which produces
potential $V = \frac{1}{4\pi\varepsilon_o} \frac{3q}{r}$ at a distance r from it is

A. 3q

B. $\frac{3q}{4\pi\varepsilon_o}$

C. $\frac{3q}{r}$

D. $\frac{3q}{4\pi\varepsilon_o r}$

T.O. 73

CR

Two equal charges q are placed at two corners of equilateral triangle of side a. The electric potential at the third corner of the triangle is

A. zero

B. $\frac{1}{4\pi\varepsilon_o}\frac{2q}{a^2}$

C. $\frac{1}{4\pi\varepsilon_o}\frac{q}{a}$

D. $\frac{1}{4\pi\varepsilon_o}\frac{2q}{a}$

T.O. 74

CR

A spherical conductor of radius R carries charge q. The electric potential for points $r > R$ is

A. $\frac{q}{4\pi\varepsilon_o r}$

B. $\frac{q}{4\pi\varepsilon_o R}$

C. $\frac{q}{4\pi\varepsilon_o r^2}$

D. $\frac{q}{4\pi\varepsilon_o R}$

T.O. 75

CR

The electric potential at a point due to certain charge distribution is $V = \frac{qx}{4\pi\varepsilon_o}$. The magnitude of the y-component of the electric field $E_y$ is

A. $\frac{qx^2}{8\pi\varepsilon_o}$

B. $\frac{q}{4\pi\varepsilon_o}$

C. 0

D. $\frac{q}{4\pi\varepsilon_o x}$

T.O. 76

CR

Two charges q and -3 q are placed a distance a apart. The electric potential energy of the system is

A. $\frac{3q^2}{4\pi\epsilon_o a}$

B. $\frac{3q^2}{4\pi\epsilon_o a^2}$

C. $-\frac{3q^2}{4\pi\epsilon_o a}$

D. zero

---

T.O. 77

RR

Two charged conductors are separated by a distance d. The charges on the conductors are q and -q. If the capacitance of the system is C, the potential difference between the conductors is

A. $\frac{2q}{C}$

B. $\frac{q}{C}$

C. $\frac{qd}{C}$

D. $\frac{q^2}{C}$

---

T.O. 78

RR

Two charged parallel plate conductors, each of area A are separated by a distance d. If the charges on the plates are q and -q, the capacitance C of the system is

A. $\frac{A}{d}$

B. $\frac{A}{4\pi\epsilon_o d}$

C. $\frac{\epsilon_o A}{d}$

D. $\frac{\epsilon_o d}{A}$

T.O. 80

CU

Three capacitors of capacitance 2 micro farad, 3 micro farad and 4 micro farad are connected in series. The equivalent capacitance which could relace the combination

A. is 9 micro farad

B. is greater than 9 micro farad

C. is less than 2 micro farad

D. is 2 micro farad

T.O. 81

RR

The work required W to charge a capacitor of capacitance C to produce a final charge of magnitude Q is

A. $\int_0^{\frac{Q}{C}} \frac{q}{e}\, dq$

B. $\int_0^{Q} \frac{q}{c}\, dq$

C. $\int_C^{Q} cq\,dq$

D. $\int_C^{Q} cq^2 dq$

T.O. 82

How much charge is stored on each plate of a parallel plate capacitor with capacitance C at potential V?

A. $\frac{CV}{2}$

B. CV

C. C/V

D. V/C

T.O. 83

RR

A vacuum capacitor of capacitance C is immersed in a liquid of dielectric constant $\kappa$. The capacitance of the capacitor with the dielectric $C_d$ is

A. greater than C

B. less than C

C. equal to C

D. 0

T.O. 84

Since a current flows in a conductor only when a potential difference is maintained across it, this must mean that:

A. the current exists in the source not in the conductor

B. the electrons which comprise the current are added to the circuit by the source

C. the positions which comprise the current are added to the curcuit by the source

D. the electrons which comprise the current exist in the conductor but require a difference of potential to cause a net electron flow in one direction

RR

T.O. 85

The resistivity, $\rho$, of a conducting material is expressed in which of the following units?

A. ohm

B. ohm/meter

C. ohm-meter

D. meter/ohm

T.O. 86

In circuits where Ohm's law may be applied, the resistance is said to be:

A. linear

B. non-linear

C. homogeneous

D. non-homogeneous

T.O. 87

The function of a source of emf in a circuit is

A. to introduce electrons into the circuit.

B. to collect electrons from the circuit.

C. to dampen the flow of current through resistors.

D. to maintain a potential difference between two points.

T.O. 88

The heat developed in a linear resistor is

A. independent of the resistance

B. inversely proportional to the resistance

C. proportional to resistance squared

D. directly proportional to the resistance

T.O. 89

CR

A circuit resistance, R, heats at the rate dU/dt. Which equation expresses the current, $i$, through the resistance?

A. $i = R \frac{dU}{dt}$

B. $i = \frac{1}{R} \frac{dU}{dt}$

C. $i = \sqrt{R \frac{dU}{dt}}$

D. $i = \sqrt{R \frac{}{dt}}$

T.O. 90

RR

In a closed single loop circuit, where r is the internal resistance of the source, R is the circuit resistance, $i$ is current and ε is the emf of the source, which is an appropriate loop equation?

A. $-\varepsilon + ir = 0$

B. $\varepsilon + ir + iR = 0$

C. $\varepsilon - ir - iR = 0$

D. $\varepsilon + ir - iR = 0$

T.O. 91

Adding resistances in parallel to a single seat of emf will:

A. decrease the total current in the circuit.

B. increase the total current in the circuit.

C. decrease the voltage drops across the resistances.

D. increase the voltage drops across the resistances.

T.O. 92

The algebraic sum of all currents at a branch point must equal zero. This is

A. Ohm's Law

B. Lenz's Law

C. Kirchoff's first rule of electric networks

D. Grauss's Law

T.O. 93

CU

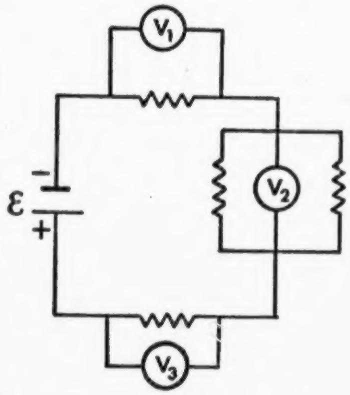
Which equation correctly describes the potential charges around the circuit shown?

A. $\varepsilon - V_1 - V_2 - V_3 = 0$

B. $\varepsilon + V_1 - V_2 - V_3 = 0$

C. $-\varepsilon + V_1 - V_2 + V_3 = 0$

D. $\varepsilon + V_1 + V_2 + V_3 = 0$



T.O. 94

An ammeter is actually a galvanometer with a relatively:

A. high shunt resistance in parallel with the galvanometer.

B. low shunt resistance in parallel with the galvanometer.

C. high shunt resistance in series with the galvanometer.

D. low shunt resistance in series with the galvanometer.

T.O. 95

The voltmeter is actually a galvanometer with a relatively:

A. high resistance in series with the galvanometer.

B. high resistance in parallel with the galvanometer.

C. low resistance in series with the galvanometer.

D. low resistance in parallel with the galvanometer.

CU

T.O. 96

The Wheatstone bridge is a device used for determining

A. that a circuit is closed.

B. faulty circuit components.

C. the value of unknown resistances.

D. the value of unknown potentials.

T.O. 97

RR

The lines of magnetic induction are drawn so that the number of lines per unit cross-sectional area is:

A. Proportional to square of the magnitude of the magnetic field B.

B. Inversely proportional to square of the magnitude of the magnetic field B.

C. Proportional to the magnitude of the magnetic field B.

D. Inversely proportional to the magnitude of the magnetic field B.

T.O. 98

CR

A proton (charge e and mass, $m_p$) moving with a velocity $\vec{V} = V_o\hat{i}$ is found to experience a force $\vec{F} = F_o\hat{j}$ at a point due only to the presence of magnetic field of magnitude

A. $B = eF_o V_o m_p$

B. $B = \frac{F_o}{V_o e\, m_p}$

C. $B = \frac{F_o}{V_o} e$

D. $B = \frac{F_c}{eV_o}$

T.O. 99

CR

A closed hemispherical surface of radius R is placed in a uniform magnetic field of magnitude B. The magnetic flux through the surface is

A. $\pi R^2 B$

B. zero

C. $2\pi R^2 B$

D. $4\pi R^2 B$

T.O. 100

RR

A charge q enters a magnitic field of magnitude B with speed v in perpendicular direction. The magnitude of magnetic force on charge q is

A. zero

B. qvB

C. qv/B

D. $\frac{qB}{v}$

T.O. 101 RR

The vertical component of the Earth's magnetic field is generally directed

A. downward in the northern hemisphere and upward in the southern hemisphere

B. upward in the northern hemisphere and downward in the southern hemisphere

C. downward in both hemispheres

D. upward in both hemispheres

---

T.O. 102 CU

A conducting wire of length $\ell$ which carries a current $i$ in the positive x-direction is brought into a uniform magnetic field $\vec{B} = B\hat{i}$. The magnitude of the magnetic force on the wire is

A. $\ell B$

B. $iB$

C. zero

D. $i\ell B$

---

T.O. 103 CR

A rectangular loop of wire of sides a and b carrying a current $i$ lies in the x-y plane. If a uniform magnetic field $\vec{B} = B_o\hat{i}$ exists throughout the region, the magnitude of the torque acting on the loop is

A. $iab\ B_o$

B. 0

C. $iB_o(a + b)$

D. $2iB_o(a + b)$

T.O. 104 RR

A galvanometer is a

A. voltage measuring device

B. current measuring device

C. charge measuring device

D. heat measuring device

T.O. 105 RR

The magnitude of the magnetic moment $\mu$ of a small circular coil of radius r carrying current $i$ is

A. $4\pi r^2 i$

B. $\pi r^2 i$

C. $\frac{\pi r^2}{i}$

D. $\frac{i}{4\pi r^2}$

T.O. 106

A proton is positively charged ($q_p = |q_e|$) and $m_p = 1836\ m_e$. proton and an electron are released in the plane of the paper the positive x-direction, there being a uniform magnetic field directed perpendicularly into the plane of the paper. Which o the following statements correctly describes the motion of the particles.

A. the electron rotates counterclockwise, the proton clockwi in the plane of the paper

B. both rotate clockwise in the plane of the paper

C. both rotate counterclockwise in the plane of the paper

D. the electron rotates clockwise, the proton counterclockwi in the plane of the paper

T.O. 107

RR

An infinitely long straight conductor carries a current $i$. The direction of the magnetic field at a point distant a from the conductor is

A. parallel to the wire and in the direction of the current

B. parallel to the wire and directed opposite to the current

C. normal to the conductor and directed inwards

D. tangent to a circle of radius a in a plane perpendicular to the wire

T.O. 108

CR

An infinitely long straight conductor carries a current $i$. The magnitude of the magnetic field at a point distant d from the conductor is

A. independent of d

B. proportional to d

C. proportional to $\frac{1}{d}$

D. proportional to $\frac{1}{d^2}$

T.O. 109

PS

An infinitely long cylindrical wire of radius R carries a current I uniformly distributed over its cross section. The magnitude of the magnetic field B at a point inside the wire distant $r < R$ from the center of the wire is

A. $\frac{\mu_o I}{2\pi r}$

B. $\frac{\mu_o I}{2\pi r} \frac{r^2}{R^2}$

C. $\frac{\mu_o I}{2\pi} \frac{r}{R^2}$

D. $\frac{\mu_o I}{2\pi r} R^2$

T.O. 110

CR

Two current-carrying conductors are placed at distance d parallel to one another. The conductors carry the currents $i_1$ and $i_2$ in same directions. The force on conductor 1 due to conductor 2 is

A. proportional to $i_2$ only

B. proportional to $i_1$ only

C. proportional to both $i_1$ and $i_2$

D. independent of $i_1$ and $i_2$

T.O. 111

RR

In mks system of units electric current is measured in

A. volts

B. coloumbs

C. ohms

D. amperes

T.O. 112

RR

An ideal solenoid of length $\ell$ and radius R has n turns per unit length and is carrying current $i$. The magnetic field inside the solenoid is proportional to

A. n only

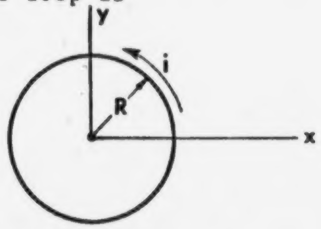
B. $n^2$

C. both $i$ and n

D. $i$ only

T.O. 113 RR

A circular loop of radius R carries a current i as shown in the diagram. The direction of the magnetic field due to the loop at the center of the loop is



A. in the positive x-direction
B. in the positive y-direction
C. out of the plane of paper
D. into the plane of paper

T.O. 114 PS

A rectangular coil of area A is initially located in the vertical plane, i.e., y-z plane and a uniform magnetic field $\vec{B} = B_o\hat{i}$ exists throughout the region. If the loop is brought from its initial position to the horizontal position, i.e., x-z plane in a time interval $\Delta t$, the magnitude of the average emf $\bar{\varepsilon}$ induced in the coil is

A. $AB_o\Delta t$

B. $A\,\dfrac{B_o}{\Delta t}$

C. 0

D. $\dfrac{B_o}{A\,\Delta t}$

T.O. 115 CR

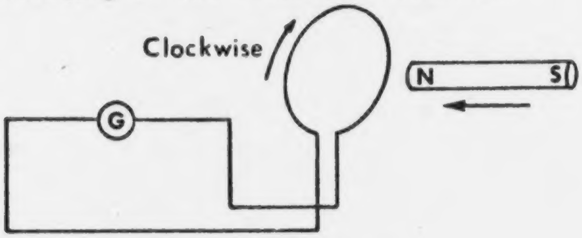
If the north pole of the magnet in the diagram below is moving toward the loop, the current in the loop is

A. in the counter clockwise direction

B. increasing in the clockwise direction

C. unchanged

D. decreasing in the clockwise direction



T.O. 116

CR

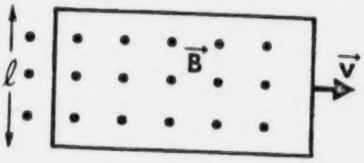
A closed conducting loop as shown in the diagram is being moved to the right at a constant speed v. If the loop has a total resistance R, then the current $i$ in the loop is

A. $B\ell v/R$, clockwise

B. $B\ell v/R$, counter clockwise

C. $B\ell v$, clockwise

D. $B\ell/vR$, clunter clockwise



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T.O. 117

RR

The relationship between the inductance L of a coil which carries a current $i$ and flux linkage $N\phi_B$ caused by $i$ is

A. $L = N\phi_B/i$

B. $L = i/N\phi_B$

C. $Li = N\phi_B$

D. $L = N\phi_B i$

---

T.O. 118

CR

A long cylindrical solenoid of radius R and length $\ell$ has N turns. The inductance L of the solenoid is

A. $\frac{\mu_o \pi N R^2}{\ell}$

B. $\frac{\mu_o \pi N^2 R^2}{\ell}$

C. $\frac{\mu_o \pi N^2 R^2}{\ell^2}$

D. $\frac{\mu_o \pi N R^2}{\ell^2}$

T.O. 119 CU

When a emf is applied to a coil with a self inductance L and a resistance R causing the current to increase. The power delivered by the emf is partly dissipated by the resistance in amount $i^2R$ and partly stored in the field as

A. Mechanical energy

B. Joule heat

C. Electric energy

D. Magnetic energy

T.O. 120 RR

The magnetic energy per unit volume stored in the magnetic field in a closed wound solenoid is equal to

A. $\mu_o B$

B. $\frac{1}{2} B^2$

C. $\mu_o B^2$

D. $\frac{B^2}{2\mu}$

T.O. 121 RR

A resistor of resistance R and a capacitor of capacitance C are connected in series with a seat of emf $\varepsilon$. The charge q on the capacitor at the time t after the connection is made is

A. $C\varepsilon\, e^{-t/RC}$

B. $\frac{\varepsilon}{C} e^{-t/RC}$

C. $C\varepsilon\left(1 - e^{-t/RC}\right)$

D. $C\varepsilon\left(e^{-t/RC} - 1\right)$

T.O. 122

RR

The instant after a seat of emf $\varepsilon$ is placed into an RC (where R is resistance and C is capacitance) circuit, the current flowing in the circuit will be approximately

A. $\frac{\varepsilon}{R}$

B. $.63 \quad \frac{\varepsilon}{R}$

C. $.37 \quad \frac{\varepsilon}{R}$

D. 0

T.O. 123

CR

The equation which represents the current $i$ during discharge of a capacitor C, charged to a potential $\varepsilon$, through a resistance R is:

A. $i = -\frac{\varepsilon}{R}$

B. $i = -\frac{\varepsilon}{R}\left(1 - e^{-t/RC}\right)$

C. $i = -\frac{\varepsilon}{R}\left(e^{-t/RC}\right)$

D. $i = -\frac{\varepsilon}{R}\left(1 - e^{-RC}\right)$

T.O. 124

CR

Which of the following equations expresses the current in an RL circuit (a resistance R, inductance L) with a source $\varepsilon$?

A. $i = \frac{\varepsilon}{R}\left(e^{-Rt/L}\right)$

C. $i = \frac{\varepsilon}{R}\left(1 - e^{-Rt/L}\right)$

B. $i = \frac{\varepsilon}{R}\left(e^{-t/RL}\right)$

D. $i = \frac{\varepsilon}{R}\left(1 - e^{-t/RL}\right)$

T.O. 125

RR

A resistor of resistance R and a inductor of inductance L are connected in series with a source of emf $\varepsilon$ . After the equilibrium is reached, the source of emf is removed. The current in the circuit at the instant the source of emf is removed is

A. 0

B. $.37 \frac{\varepsilon}{R}$

C. $.63 \frac{\varepsilon}{R}$

D. $\frac{\varepsilon}{R}$

---

T.O. 126

CR

In an RL circuit, when the current is decaying the potential difference across the inductor is

A. $\varepsilon$

B. $-\varepsilon e^{-Rt/L}$

C. $\varepsilon\ 1 - e^{-Rt/L}$

D. $\varepsilon/R\ e^{-Rt/L}$

Pi

T.O. 49

CU

Two charges +q and -q are placed at a distance r apart. If the distance between the charges is doubled, the magnitude of the force acting on the charge +q

A. remains uncharged

B. is doubled

C. is halved

D. is one-fourth

T.O. 50

RR

Our basic views of positive and negative charges stem from

A. rubbing glass and rubber rods

B. the markings on battery terminals

C. experiments in hydrolysis of water

D. observations of particle deflection in accelerators

T.O. 51

CU

The modern view of bulk matter in its neutral or normal state is that

A. it has excess of negative charge

B. it has excess of positive charge

C. it is neutral

D. none of the above

### T.O. 52

RR

A positive charge +q is placed in an electric field $\vec{E} = Ei$. The force $\vec{F}$ acting on the charge is

A. $-qE\,\hat{j}$

B. $-qE\,\hat{i}$

C. $qE\,\hat{j}$

D. $qE\,\hat{i}$

### T.O. 53

PS

Two point charges q and -2q are placed at (o,o) and (a,o) respectively in a given x-y coordinate system. The electric field $\vec{E}$ at (2a,o) due to the two charges is

A. $\dfrac{-7q\,\hat{i}}{16\pi\varepsilon_0 a^2}$

B. 0

C. $\dfrac{-5q\,\hat{i}}{16\pi\varepsilon_0 a^2}$

D. $\dfrac{-3q\,\hat{i}}{16\pi\varepsilon_0 a^2}$

### T.O. 54

RR

Two uncharged pith balls are touched by negatively charged glass rods. If the pith balls were not in contact before being touched by the rods, what happens immediately afterwards?

A. The pith balls move away from each other.

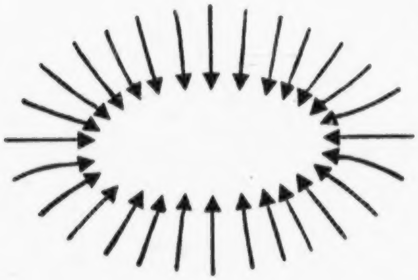
B. The pith balls are not effected by the presence of the rod.

C. The pith balls move towards each other.

D. The pith balls oscillate about their original positions.

T, O. 55 RR

A portion of an electric field line diagram shown has been erased. Of the four choices given below, which is most likely responsible for the illustrated field?



A. two positive charges

B. two negative charges

C. a single positive charge

D. a single negative charge

T.O. 56 RR

Two charges +q and -q are placed a short distance d apart and constitute a dipole. The magnitude of dipole moment is

A. $\frac{qd}{2}$

B. Zero

C. 2 qd

D. qd

T.O. 60

A nonconducting infinite sheet, coincident with y-z plane has surface charge density $\sigma$ (charge per unit area) and a point charge q is confined at a point (a,o,o). The x-componant of the electric field $E_x$ due to the charge sheet and the point charge at a point (a,a,o) is

A. $\frac{\sigma}{2\varepsilon_0}$

B. $\left[\left(\frac{\sigma}{2\varepsilon_0}\right)^2 + \left(\frac{q}{4\pi\varepsilon_0 a^2}\right)^2\right]^{1/2}$

C. 0

D. $\frac{\sigma}{4\pi\varepsilon_0 a^2}$

T.O. 61 PS

A uniform electric field $\vec{E}=E_o\hat{j}$ exists between two charged parallel plates of length ℓ as shown below.

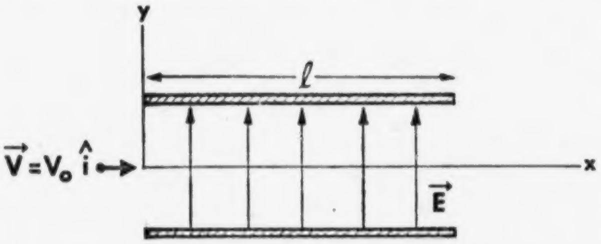
A particle of mass m and charge q enters the region of the electric field at the origin with a velocity $\vec{v} = v_o\hat{i}$. The y-coordinate of the particle as it leaves the field region is propotional to

A. ℓ

B. $\ell^2$

C. $\ell^3$

D. $\ell^{1/2}$



T.O. 62 CR

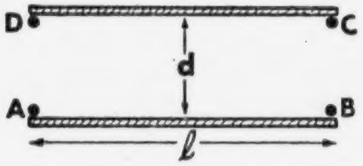
Two parallel plates of length ℓ are separated by distance d. A uniform electric field $\vec{E}=E_o\hat{j}$ exists between the plates. If a charge q is moved from point A to B to C to D to A, the total work done is

A. 2 (q Ed + q Eℓ)

B. Zero

C. 2 qEd

D. 4 q Ed



CR

T.O. 63

A particle of charge q is moved from $x = x_1$ to $x = x_2$ in a variable electric field $\vec{E} = \frac{\hat{i}}{x^2}$. The work done W is

A. 0

B. $q\int_{x_1}^{x_2} \frac{dx}{x^2}$

C. $-q\int_{x_1}^{x_2} \frac{dx}{x^2}$

D. $-q\int_{x_2}^{x_1} \frac{dx}{x^2}$

T.O. 64

RR

A general expression for the electric flux through a surface is given by an integral

A. $\phi_E = \int_{\text{surface}} \vec{E}\cdot d\vec{S}$

B. $\phi_E = \int_{\text{surface}} \vec{E} \times d\vec{S}$

C. $\phi_E = 0$

D. $\phi_E = ES$

---

T.O. 65

CR

A surface of area S is coincident with y-z plane. If a uniform electric field $\vec{E} = E_o\hat{k}$ exists throughout the space in consideration, the electric flux through the surface is

A. $\frac{S}{E_o}$

B. $SE_o\hat{k}$

C. 0

D. $SE_o$

---

T.O. 66

CU

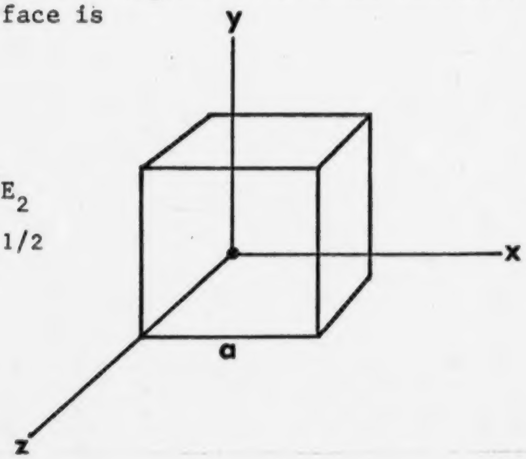
A cube of side a is placed in a uniform electric field $\vec{E} = E_1\hat{j} + E_2\hat{k}$ as shown in the diagram. The total electric flux through the cubical surface is

A. $a^2E_1 + a^2E_2$

B. 0

C. $2\,a^2E_1 + 2\,a^2E_2$

D. $a^2(E_1{}^2 + E_2{}^2)^{1/2}$



RR

The relationship between electric flux $\phi$ through a closed surface and the net charge q enclosed within the surface is given by

A. $\phi = \varepsilon_o qE$

B. $\phi = \frac{q}{4\pi\varepsilon_o}$

C. $\phi = \varepsilon_o q$

D. $\phi = \frac{q}{\varepsilon_o}$

T.O. 68

CR

Two concentric spherical conductors of radii a and b ($b > a$) carry charges $q_1$ and $q_2$ respectively. The magnitude of the electric field at a point $a < r < b$ is

A. $\frac{(q_1 - q_2)}{4\pi\varepsilon_o r^2}$

B. $\frac{q_1}{4\pi\varepsilon_o r^2}$

C. $\frac{q_1}{4\pi\varepsilon_o a^2}$

D. $\frac{q_1 + q_2}{4\pi\varepsilon_o (b^2 - a^2)}$

T.O. 69

PS

Two concentric spherical conductors of radii a and b ($b > a$) carry charges $q_1$ and $q_2$ respectively. The magnitude of electric field for $r > b$ is found to be zero. The relationship between $q_1$ and $q_2$ is

A. $q_1 > q_2$

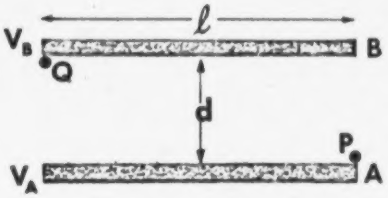
B. $q_1 = q_2$

C. $q_1 = -q_2$

D. $q_1 < q_2$

T.O. 71 CR

Two parallel plates A and B of length $\ell$ are separated by a distance d and are maintained at electric potentials $V_A$ and $V_B$ respectively. If a charge q is moved from a point P to a point Q, the work done is



A. $q\ell(V_B - V_A)$

B. $qd\ell(V_B - V_A)$

C. $qd(V_B - V_A)$

D. $q(V_B - V_A)$

T.O. 72 RR

The electric potential due to a point charge q at a distance r from it is

A. $\frac{1}{4\pi\varepsilon_o} \frac{q}{r^2}$

B. $\frac{1}{4\pi\varepsilon_o} qr$

C. $\frac{1}{4\pi\varepsilon_o} \frac{r}{q}$

D. $\frac{1}{4\pi\varepsilon_o} \frac{q}{r}$

T.O. 73 CR

Two charges q and -q are placed 2a apart. The electric potential at the midpoint of the line joining the two charges is

A. $\frac{2q}{4\pi\varepsilon_o a}$

B. 0

C. $\frac{q}{4\pi\varepsilon_o a}$

D. $\frac{-2q}{4\pi\varepsilon_o a}$

T.O. 74

CR

A spherical conductor of radius R carries a charge q. The electric potential for points $r < R$ is

A. proportional to $\frac{q}{r}$

B. proportional to $\frac{q}{r^2}$

C. proportional to $\frac{q}{R}$

D. proportional to $\frac{q}{(R - r)}$

T.O. 75

CR

The electric potential at a point due to certain distribution is $V = \frac{qx}{4\pi\varepsilon_o}$. The magnitude of the x-component of the electric field $E_x$ is

A. $\frac{qx^2}{8\pi\varepsilon_o}$

B. $\frac{q}{4\pi\varepsilon_o}$

C. 0

D. $\frac{q}{4\pi\varepsilon_o x}$

T.O. 76

CR

Two identical charges q are placed a distance a apart. The electric potential energy of the system is

A. zero

B. $\frac{q}{4\pi\epsilon_o a}$

C. $\frac{q^2}{4\pi\epsilon_o a}$

D. $\frac{q^2}{4\pi\epsilon_o a^2}$

T.O. 77

RR

Two charged conductors are separated by distance d. The charges on the conductors are q and -q. The potential difference between the conductors is V. The capacitance C of the system is proportional to

A. $V/q$

B. $q/V$

C. $qV$

D. $1/qV$

T.O. 78

RR

Two identical parallel plate conductors are separated by a distance d. If the charges on the plates are q and -q and the capacitance of the system is C, the area of each plate is

A. $\frac{d}{C}$

B. $Cd$

C. $\epsilon_o Cd$

D. $\frac{Cd}{\epsilon_o}$

T.O. 80

RR

Two capacitors of capacitance $C_1$ and $C_2$, are connected in series. The equivalent capacitance C which could replace the combination of $C_1$ and $C_2$ is

A. $\frac{C_1C_2}{C_1 + C_2}$

B. $\frac{C_1 + C_2}{C_1C_2}$

C. $C_1 + C_2$

D. $\frac{C_1 + C_2}{2}$

T.O. 81

RR

The work required W to charge a capacitor of capacitance C to a potential difference V is:

A. $\frac{1}{2} VC^2$

B. $\frac{1}{2} CV^2$

C. $VC^2$

D. $CV^2$

T.O. 82

CR

Two capacitors having capacitances $C_1$ and $C_2$ are connected in parallel across a source of emf $\varepsilon$. After the capacitors are charged, the charges on capacitors $C_1$ and $C_2$ are

A. both $\varepsilon(C_1 + C_2)$

B. $\varepsilon C_1$ and $\varepsilon C_2$ respectively

C. $\varepsilon C_2$ and $\varepsilon C_1$ respectively

D. $\frac{\varepsilon}{C_1}$ and $\frac{\varepsilon}{C_2}$ respectively

T.O. 83

RR

A vacuum capacitor of capacitance C is immersed in a liquid of dielectric constant $\kappa$. The expression for the capacitance of the capacitor with the dielectric $C_d$ is

A. $C_d = \frac{C}{\kappa}$

B. $C_d = C \frac{\epsilon_o}{\kappa}$

C. $C_d = \kappa C$

D. $C_d = \epsilon_o C$

Connecting a source of potential difference causes a current to flow in a conductor

A. by absorbing the "dormat" electrons in the conductor

B. by setting up an electric field within the conductor to which the electrons respond

C. since the conductor forms a path which allows the current to "escape" from the source of potential difference

D. by contributing the electrons which flow as the current through the conductor

---

T.O. 85 CR

The resistivity, $\rho$, of a conducting material is defined as the ratio of the electirc intensity, E, to the current density, j. Which one of the following is also an expression for $\rho$? ($v$ = potential, $\ell$ = length, A = cross-sectional area, $i$ = current, R = resistance)

A. $\rho = \frac{Vi\ell}{A}$

B. $\rho = R\,\frac{\ell}{A}$

C. $\rho = \frac{VA}{i\ell}$

D. $\rho = \frac{Vi}{R\ell}$

---

T.O. 86

Ohm's law may be applied

A. universally to every circuit

B. only to circuits where the resistance is independent of the current and the voltage applied

C. only to circuits where the resistance is dependent on the current and voltage applied

D. only to circuits where the current and voltage are kept constant

T.O. 87

Which of the following can be a seat of emf in a circuit?

A. resistor

B. storage battery

C. switch

D. coil or solenoid

---

T.O. 89

Which of the following expresses the rate of heat loss from a circuit of known current $i$ and voltage V?

A. $\frac{dU}{dt} = iV$

B. $\frac{dU}{dt} = i^2V$

C. $\frac{dU}{dt} = iV^2$

D. $\frac{dU}{dt} = i/V$

---

T.O. 90

RR

In a single loop resistive circuit where $\varepsilon$ is the source emf, R is the circuit resistance and r is the internal source resistance, which equation expresses the current in the loop?

A. $\frac{\varepsilon}{r + R}$

B. $\frac{\varepsilon}{rR}$

C. $\frac{r + R}{\varepsilon}$

D. $\frac{rR}{\varepsilon}$

T.O. 91

In a series circuit with one seat of emf

A. the current is the same throughout the circuit.

B. the current differs through each resistor according to Ohm's law.

C. the voltage drop across each resistor is the same throughout the circuit.

D. both the current and the voltage drops at each resistor differ according to Ohm's law.

T.O. 92

Kirchoff's first rule of electric networks states that the sum of all currents at a branch point must be zero. This rule is implied by the conservation of:

A. momentum

B. voltage

C. charge

D. energy

T.O. 93

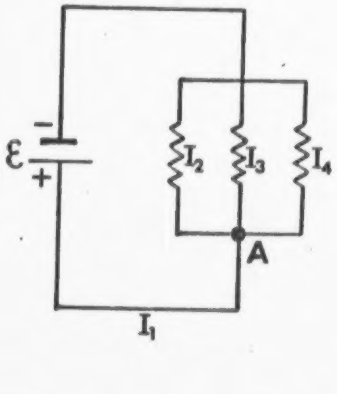
Which of the following equations correctly describes the current(s) at point A in the circuit?

A. $I_1 + I_2 + I_3 + I_4 = 0$

B. $I_1 - I_2 - I_3 - I_4 = 0$

C. $-I_1 - I_2 + I_3 + I_4 = 0$

D. $-I_1 - I_2 - I_3 + I_4 = 0$



T.O. 94

RR

An ammeter is used to measure

A. current

B. voltage

C. capacitance

D. resistance

T.O. 95

CR

A voltmeter is a galvanometer with a high resistance in series with a coil and the combination is placed in parallel with the circuit. This causes:

A. an increase of current, proportinate to the meter's resistance to flow to accomodate the voltmeter in the circuit.
B. a decrease of current, proportionate to the meter's resistance, to flow to minimize "losses" in the meter.
C. a negligible current to flow through the meter to minimize its effect in the circuit.
D. virtually all of the current to flow through the meter in order to measure all of the voltage.

T.O. 96

A device used to accurately determine the value of an unknown resistance by comparing it with a known resistance is known as the:

A. Wheatstone bridge

B. Joule's apparatus

C. ohmmeter

D. potentiometer

T.O. 97

RR

The lines of magnetic induction are drawn so that

A. a normal to a line of induction at any point gives the direction of $\vec{B}$ field at that point

B. a tangent to a line of induction at any point gives the direction of $\vec{B}$ field at that point

C. a line drawn making an angle of 45° to the tangent to a line of induction at any point gives the direction of $\vec{B}$ field at that point

D. to obtain information regarding the magnitude of the $\vec{B}$ field only

T.O. 98

CR

A proton (charge e and mass, $m_p$) moving with a velocity $\vec{V} = V_o\hat{i}$ is found to experience a force $\vec{F} = F_o\hat{j}$ at a point due only to the presence of magnetic field of magnitude

A. $B = e\, F_o V_o\, m_p$

B. $B = \dfrac{F_o}{V_o\, e\, m_p}$

C. $B = \dfrac{F_o\, e}{V_o}$

D. $B = \dfrac{F_o}{e\, V_o}$

T.O. 99

CR

A hemispherical bowl of radius R is placed in a uniform magnetic field of magnitude B. The open flat end of the bowl is normal to the field. The magnetic flux through the bowl is

A. $\pi R^2 B$

B. $4\pi R^2 B$

C. $2\pi R^2 B$

D. zero

T.O. 100

RR

A charge q enters a magnetic field of magnitude B with speed v and $\vec{v}$ and $\vec{B}$ are parallel to each other. The magnetic force on the charge is

A. zero

B. qvB

C. $q\,\frac{v}{B}$

D. $q\,\frac{B}{v}$

T.O. 101

RR

The horizontal component of the Earth's magnetic field is generally directed

A. northward in the northern hemisphere and southward in the southern hemisphere

B. southward in the northern hemisphere and northward in the southern hemisphere

C. northward in both hemispheres

D. southward in both hemispheres

T.O. 102

CU

A conducting wire of length $\ell$ which carries a current $i$ in the negative x-direction is brought into a uniform magnetic field $\vec{B} = B\hat{k}$ The direction of the magnetic force on the wire is in

A. negative y-direction

B. positive y-direction

C. negative z-direction

D. positive x-direction

T.O. 103

CR

A rectangular loop of wire of sides a and b carrying a current $i$ lies in the x-y plane. If a uniform magnetic field $\vec{B} = -B_o k$ exists throughout the region, the magnitude of the torque acting on the loop is

A. $i ab B_o$

B. $i B_o(a + b)$

C. 0

D. $2 i B_o(a + b)$

T.O. 104

RR

A primary purpose of a galvanometer is to measure

A. voltage

B. charge

C. capacitance

D. current

T.O. 105

RR

The magnitude of the magnetic moment $\mu$ of a small coil of area A carrying a current $i$ is

A. $A^2 i$

B. $A i^2$

C. $A i$

D. $(A i)^2$

T.O. 106

CR

A charged particle of mass m, charge q entering a magnetic field perpendicularly with uniform velocity v will follow a circular path while in the influence of the field whose radius is proportional to

A. qB and inversely proportional to mv

B. $v^{1/2}$

C. mv and inversely proportional to qB

D. $m^{1/2}$

T.O. 107

RR

A long straight conductor carries a current $i$. The magnetic field lines around the conductor are

A. parallel to the wire and in the direction of the current

B. parallel to the wire and directed opposite to the current

C. normal to the conductor and directed outwards

D. circular in a plane perpendicular to the wire

T.O. 108

CR

An infinitely long straight conductor carries a current $i$. The magnitude of the magnetic field at a point distant d from the conductor is

A. $\mu_o i$

B. $\frac{\mu_o}{4\pi} i$

C. $\frac{\mu_o i}{4\pi d}$

D. $\frac{\mu_o i}{2\pi d}$

T.O. 109

PS

An infinitely long cylindrical wire of radius R carries a current I uniformly distributed over its cross section. The magnitude of the magnetic field B at a point inside the wire distant $r < R$ from the center of the wire is

A. proportional to $\frac{1}{r}$

B. proportional to $\frac{1}{r2}$

C. proportional to r

D. proportional to $r^2$

T.O. 110

CR

Two current carrying conductors are placed at distance d parallel to one another. The currents in the conductors are of magnitude $i_1$ and $i_2$ and are in same directions. The force on one conductor due to the other is

A. attractive, of equal magnitude

B. repulsive, of equal magnitude

C. attractive, of unequal magnitude

D. repulsive, of unequal magnitude

T.O. 111

CU

In mks system of units, the unit of electric current the ampere is defined

A. using the concept of electric charge on an electron

B. using the concept of electric charge on a proton

C. using the concept of forces of attraction between long parallel current-carrying wires

D. using the concept of amount of electric charge crossing a given area per unit of time

T.O. 112

CU

For an ideal solenoid of length $\ell$ and radius R which has n turns per unit length and current $i$, the field outside of the solenoid is

A. proportional to n only

B. zero

C. proportional to $i$ only

D. proportional to both $i$ and n

T.O. 113

RR

According to the Biot-Savart law, the contribution to the magnetic field $d\vec{B}$ due to an element $d\vec{\ell}$ carrying current $i$ at a distance r is

A. $\frac{\mu_o i}{4\pi} \frac{d\vec{\ell} \times \vec{r}}{r^2}$

B. $\frac{\mu_o i}{4\pi} \frac{d\vec{\ell} \times \vec{r}}{r^3}$

C. $\mu_o i \frac{d\vec{\ell} \times \vec{r}}{r^2}$

D. $\mu_o i \frac{d\vec{\ell} \times \vec{r}}{r^3}$

T.O. 114

PS

A rectangular coil of area A is initially located in the vertical plane, i.e., y-z plane and a uniform magnetic field $\vec{B} = B_o\hat{k}$ exists throughout the region. If the loop is brought from its initial position to the horizontal position, i.e., x-z plane in a time interval $\Delta t$, the magnitude of the average emf $\overline{\varepsilon}$ induced in the coil is

A. $AB_o\Delta t$

B. $A \frac{B_o}{\Delta t}$

C. 0

D. $\frac{B_o}{A\,\Delta t}$

T.O. 115

CR

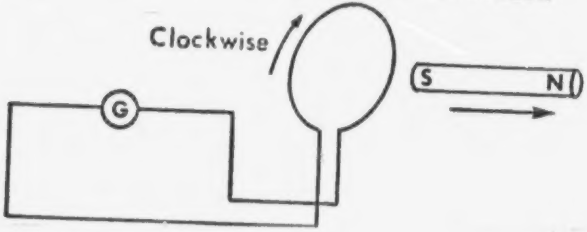
If the north pole of the magnet in the diagram below is moving away from the loop, the current in the loop is

A. decreasing in the clockwise direction

B. unchanged

C. in the counter clockwise direction

D. increasing in the clockwise direction



T.O. 116

RR

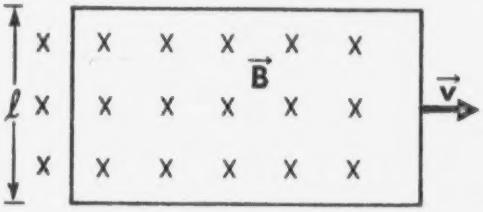
A closed conducting loop as shown in the diagram is being moved to the right at a constant speed v. The induced emf in the circuit is

A. $Bv/\ell$

B. $Bv$

C. $B\ell v$

D. $B/\ell\, v$



T.O. 117

RR

The defining equation for an inductance L of a coil in terms of induced emf ε and a time varying current $i$ is

A. $L = -\varepsilon \frac{di}{dt}$

B. $L = -\varepsilon/di/dt$

C. $L = -\frac{di}{dt}/\varepsilon$

D. $L = \varepsilon \frac{di}{dt}$

T.O. 118 RR

The inductance L of a long solenoid having n turns per unit length of length $\ell$ and cross-sectional area A is

A. $\mu_o n \ell A$

B. $\mu_o n^2 \ell A$

C. $\mu_o i n \ell A$

D. $\mu_o i^2 n \ell A$

T.O. 119 RR

When a emf is applied to a coil with a self inductance L and a resistance R causing the current to increase the power delivered by the emf is partly dissipated by the resistance in amount

A. $iR^2$

B. $Li \frac{di}{dt}$

C. $i^2R$

D. $iR$

T.O. 120 CR

An emf $\varepsilon$ is applied to a coil of inductance L and resistance R. The energy stored in the magnetic field after the current reaches its maximum value $i$ is

A. $\frac{1}{2} Li^2$

B. $\frac{1}{2} L \frac{di}{dt}$

C. $\frac{1}{2} Li$

D. $L^2 i$

### T.O. 121

PS

A resistor of resistance R and a capacitor of capacitance C are connected in series with a seat of emf $\varepsilon$. The current $i = dq/dt$ in the circuit at the time t after the connection is made is

- A. $-\frac{\varepsilon}{R} e^{-t/RC}$
- B. $-C\varepsilon\, e^{-t/RC}$
- C. $\frac{\varepsilon}{R} e^{-t/RC}$
- D. $\frac{\varepsilon}{R} \left(1 - e^{-t/RC}\right)$

### T.O. 122

RR

A seat of emf $\varepsilon$ is connected to an RC circuit (R is resistance and C is capacitance. As time increased to infinity, the current which flows through the circuit

- A. approaches $\frac{\varepsilon}{R}$
- B. is .37 $\frac{\varepsilon}{R}$
- C. is .63 $\frac{\varepsilon}{R}$
- D. decreases to 0.

### T.O. 123

CU

The seat of enf $\varepsilon$ is removed from an RC circuit with fully charged capacitor C. The amount of charge remaining on the plates of the capacitor after a duration RC will be

- A. zero.
- B. .63 of equilibrium charge.
- C. .50 of equilibrium charge
- D. .37 of equilibrium charge

T.O. 124

RR

In a circuit consisting of an inductance, L, a resistance, R, and a seat of emf, $\epsilon$ , the inductive time constant is given by:

A. RL

B. $\frac{\varepsilon}{R}$

C. L/R

D. $\frac{\varepsilon}{R}$

---

T.O. 125

RR

A resistor of resistance R and a inductor of inductance L are connected in series with a source of emf $\varepsilon$ . After the equilibrium is reached the source of emf is removed. The current in the circuit at the time R/L after the source of emf is removed is

A. 0

B. $.37 \frac{\varepsilon}{R}$

C. $.50 \frac{\varepsilon}{R}$

D. $.63 \frac{\varepsilon}{R}$

---

T.O. 126

In a RL circuit, when the current is allowed to decay, the rate at which the current is changing is

A. $\varepsilon/R\ e^{-Rt/L}$

B. $\varepsilon/L\ e^{-Rt/L}$

C. $\varepsilon/R$

D. $-\varepsilon/L\ e^{-Rt/L}$

KHO

T.O. 49

R

Two charges +q and -q are placed a distance r apart. The force acting on the charge +q is

A. Attractive

B. repulsive

C. greater than the force acting on the charge -q

D. less than the force acting on the charge -q

T.O. 50

The charge developed on an insulated glass rod rubbed with a silk cloth is designated

A. positive

B. negative

C. neutral

D. none of the above

T.O. 51

CU

The principle of conservation of charge can be stated as

A. charges always appear in pairs

B. like charges repel; unlike attract

C. the quantity of work done on a charge by an externally generated field is constant

D. the quantity of charge in a closed system does not change

T.O. 52

RR

A negative charge -q is placed in an electric field $\vec{E} = E\hat{i}$. The force $\vec{F}$ acting on the charge is

A. $+qE\ \hat{j}$

B. $qE\ \hat{i}$

C. $-qE\ \hat{i}$

D. $-qE\ \hat{j}$

T.O. 53

PS

Two point charges q and -q are placed at (o,o) and(a,o) respectively in a given x-y coordinate system. The electric field $\vec{E}$ at (2a,o) due to the two charges is

A. $\frac{3q}{16\pi\varepsilon_0 a^2}\hat{i}$

B. 0

C. $\frac{q}{4\pi\varepsilon_0 a^2}\hat{i}$

D. $\frac{-3q}{16\pi\varepsilon_0 a^2}\hat{i}$

T.O. 54

RR

Two uncharged pith balls are touched by a negatively charged glass rod. If the pith balls were in contact before being touched by the glass rod what happens immediately afterwards?

A. The pith balls remain in contact

B. The pith balls move away from each other

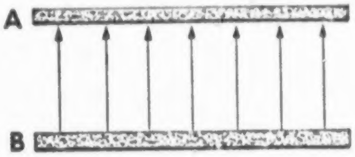
C. The pith balls attract each other

D. The pith balls are not effected by the presence of the glass rod

T.O. 55

RR

Refer to the electric field lines drawn below. What observation can be made about the nature of charges on the plates A and B?



A. A is positively charged, B is negatively charged

B. Both A and B are positively charged

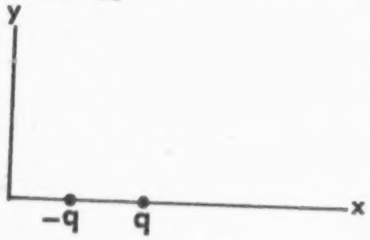
[✓ C. A is negatively charged, B is positively charged]

D. Both A and B are negatively charged

56

RR

Two charges q and -q constitute a dipole and is placed on the x-axis as shown below. The direction of the dipole moment is



A. along the positive x-axis

B. along the negative x-axis

C. along the positive y-axis

D. along the negative y-axis

T.O.60

RR

A nonconducting infinite sheet coincident with y-z plane has surface charge density σ (charge per unit area). The electric field $\vec{E}$ at a point (x, o, o) in front of the plane is

A. $\frac{\sigma}{4\pi\epsilon_o a^2}\,\hat{i}$

B. $\frac{\sigma}{2\epsilon_o}\,\hat{i}$

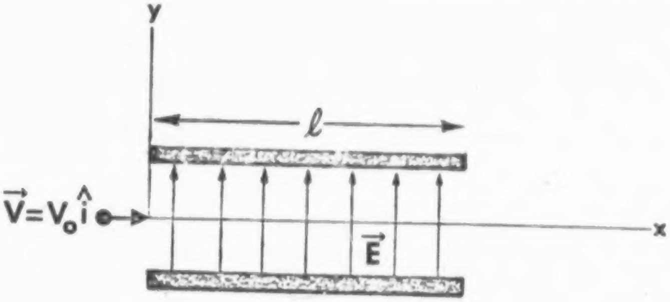
C. $\frac{-\sigma}{2\epsilon_o}\,\hat{i}$

D. $\frac{-\sigma}{2\pi\epsilon_o}\,\hat{i}$

T.O. 61

CR

A uniform electric field $\vec{E} = E_o \hat{j}$ exists between two charged parallel plates of length ℓ as shown below. A particle of mass m and charge q enters the region of the electric field at the origin with a velocity $\vec{V} = V_o \hat{i}$. The y-componant of the acceleration of the particle is



A. $\frac{m\ q}{E}$

B. 0

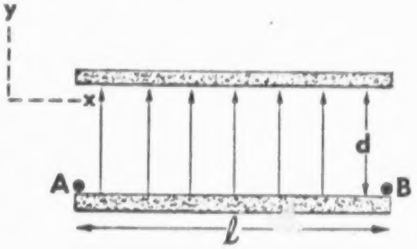
C. $\frac{q\ E_o}{m}$

D. mq E

T.O. 62

CR

Two parallel plates of length ℓ are separated by distance d. A uniform electric field $\hat{E} = E_o \hat{j}$ exists between the plates. If a charge q is moved from point A to point B, the work done is



A. $qE_o d$

B. $qE_o \ell$

C. Zero

D. $q\ E_o \ell d$

T.O. 63

RR

A particle of charge q is moved from $x = x_1$ to $x = x_2$ in a variable electric field $\vec{E}(x)$. The work done W is

A. $q\int_{x_1}^{x_2} E\, dx$

B. $q\int_{x_1}^{x_2} \vec{E}\cdot d\vec{x}$

C. $-q\int_{x_1}^{x_2} E\, dx$

D. $-q\int_{x}^{x_2} \vec{E}\cdot d\vec{x}$

T.O. 64

RR

Electric flux is a measure of

A. the field strength of a field at a unit distance from the surface

B. the number of electrons passing through a closed surface that surrounds a charge

C. the number of lines of force that cut through any hypothetical surface

D. the magnitude of the electrical force that is exerted on a unit charge placed in an electric field

T.O. 65

CR

A surface of area S is coincident with y-z plane. If a uniform electric field $\vec{E} = E_o\hat{i} + E_1\hat{j}$ exists throughout the space in consideration, the electric flux through surface is

A. $SE_o$

B. $S(E_o + E_1)$

C. 0

D. $SE_o\hat{i} + SE_o\hat{j}$

CU

T.O. 66

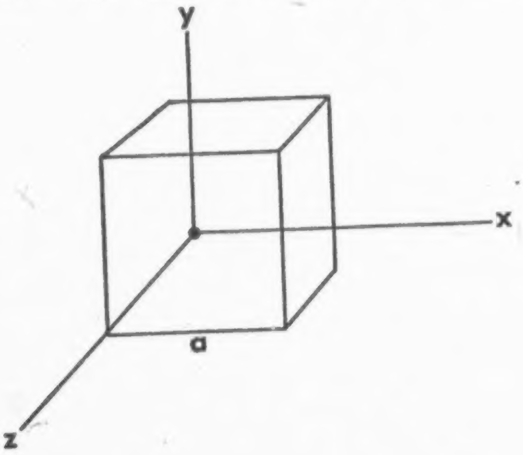
A cube of side a is placed in a uniform electric field $\vec{E} = E_o\hat{j}$ as shown in the diagram. The total electric flux through the cubical surface is

A. $a^3E_o$

B. $2\ a^2E_o$

C. $aE_o$

D. 0



T.O. 67

RR

In the equation for Gauss's law, the q term indicates

A. the given charges enclosed by the Gaussian surface

B. the net charge enclosed by the Gaussian surface

C. the net charge enclosed by the Gaussian surface and any other charges in proximity to the Gaussian surface

D. the absolute value of the net charge enclosed by the Gaussian surface

T.O. 68

CR

A spherical nonconductor of radius R carries a charge q which is uniformly distributed throughout its volume. The magnitude of the electric field at point $r > R$ is

A. 0

B. $\frac{q}{4\pi\varepsilon_o}\left(\frac{1}{R^2} - \frac{1}{r^2}\right)$

C. $\frac{q}{4\pi\varepsilon_o r^2}$

D. $\frac{4}{3}\frac{\pi q}{R^3} r$

T.O. 69

PS

A spherical conductor of radius 2 m carries charge q. The magnitude of the electric field E for points r = 3 m is found to be $E = \frac{1}{4\pi\varepsilon_o}$ nt/coul. The charge q is

A. 9 coul

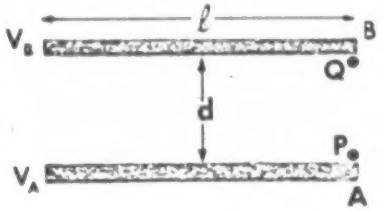
B. 3 coul

C. $9 \times 10^9$ coul

D. 4 coul

T.O. 71

Two parallel plates A and B of length $\ell$ are separated by a distance d and are maintained at electric potentials $V_A$ and $V_B$ respectively. If a charge q is moved from a point P to a point Q, the work done is



A. $q\ell(V_B - V_A)$

B. $q(V_B - V_A)$

C. $qd(V_B - V_A)$

D. $\frac{q}{d}(V_B - V_A)$

T.O. 72

RR

The value of an isolated positive point charge which produces a potential $V = \frac{1}{4\pi\varepsilon_o}\frac{3q}{r}$ at a distance r from it is

A. $3q$

B. $\frac{3q}{4\pi\varepsilon_o}$

C. $\frac{3q}{r}$

D. $\frac{3q}{4\pi\varepsilon_o r}$

T.O. 73

CR

Two charges q and $-q$ are placed at the two corners of an equilateral triangle of side a. The electric potential at the third corner of the triangle is

A. 0

B. $\frac{2q}{4\pi\varepsilon_o a}$

C. $\frac{2q}{4\pi\varepsilon_o a^2}$

D. $\frac{1}{4\pi\varepsilon_o a}$

T.O. 74

CR

A spherical conductor of radius R carries charge q. The electric potential for points $r > R$ is

A. $\frac{q}{4\pi\varepsilon_o r}$

B. $\frac{q}{4\pi\varepsilon_o R}$

C. $\frac{q}{4\pi\varepsilon_o r^2}$

D. $\frac{q}{4\pi\varepsilon_o R}$

T.O. 75

CR

The electric potential at a point due to certain charge distribution is $V = \frac{qx}{4\pi\varepsilon_o}$. The magnitude of the y-component of the electric field $E_y$ is

A. $\frac{qx^2}{8\pi\varepsilon_o}$

B. $\frac{q}{4\pi\varepsilon_o}$

C. 0

D. $\frac{q}{4\pi\varepsilon_o x}$

CR

T.O. 76

Two charges q and -3 q are placed a distance a apart. The electri potential energy of the system is

A. $\frac{3q^2}{4\pi\epsilon_o a}$

B. $\frac{3q^2}{4\pi\epsilon_o a^2}$

C. $-\frac{3q^2}{4\pi\epsilon_o a}$

D. zero

T.O. 77 RR

Two charged conductors are separated by a distance d. The charges on the conductors are q and -q. If the capacitance of the system is C, the potential difference between the conductors is

A. $\frac{2q}{C}$

B. $\frac{q}{C}$

C. $\frac{qd}{C}$

D. $\frac{q^2}{C}$

T.O. 78 RR

Two charged parallel plate conductors, each of area A are separated by a distance d. If the charges on the plates are q and -q, the capacitance C of the system is

A. $\frac{A}{d}$

B. $\frac{A}{4\pi\epsilon_o d}$

C. $\frac{\epsilon_o A}{d}$

D. $\frac{\epsilon_o d}{A}$

T.O. 80 RR

Two capacitors of capacitance $C_1$ and $C_2$, are connected in parallel. The equivalent capacitance C which could replace the combination of $C_1$ and $C_2$ is:

A. $\frac{C_1C_2}{C_1+C_2}$

B. $\frac{C_1+C_2}{C_1C_2}$

C. $C_1+C_2$

D. $\frac{C_1+C_2}{2}$

T.O. 81

RR

The work required W to charge a capacitor of capacitance C to produce a final charge of magnitude Q is

A. $\int_0^{\frac{Q}{C}} \frac{q}{e}\, dq$

C. $\int_C^Q cq\,dq$

B. $\int_0^Q \frac{q}{c}\, dq$

D. $\int_C^Q cq^2 dq$

T.O. 82

PS

Two capacitors having capacitances $C_1$ and $C_2$ are connected in series across a source of emf $\varepsilon$. After the capacitors are charged, the potential differences across capacitors $C_1$ and $C_2$ are

A. $\frac{C_2 \varepsilon}{C_1 + C_2}$ and $\frac{C_1 \varepsilon}{C_1 + C_2}$ respectively

B. $\frac{C_1 \varepsilon}{C_1 + C_2}$ and $\frac{C_2 \varepsilon}{C_1 + C_2}$ respectively

C. both $\frac{\varepsilon}{C_1 + C_2}$

D. both $\varepsilon(C_1 + C_2)$

T.O. 83

When the vacuum between the plates of a capacitor is replaced by a material of dielectric constant $\kappa$, and the capacitor is again charged, the electric field between the plates

A. increases by a factor of $\kappa$.

B. decreases by a factor of $\kappa$.

C. remains unchanged due to polarization.

D. remains unchanged because electric fields are not affected by uncharged materials.

T.O. 84

No current is flowing in an isolated conductor. This is so because:

A. the electrons are motionless until a potential difference sets them in motion

B. the electrons are motionless unitl acted upon by a magnetic field

C. the constant random motion of the electrons is such that the net directed motion in any direction is zero without a source of potential difference

D. although electrons are in constant motion producing a continuous current, the current has no energy without a source of potential difference

---

T.O. 85 RR

Resistivity, $\rho$ , of a conducting material is expressed in units of ohm-meter. If $\ell$ is the length of a conductor whose cross-sectional area is A, which one of the following expressions correctly relates resistance,R, to resistivity?

A. $R = \rho \frac{A}{\ell}$

B. $R = \rho \frac{\ell}{A}$

C. $R = \rho\ell$

D. $R = \rho A$

---

T.O. 86

In a non-linear circuit, the equation $R = V/i$ is:

A. always true by definition
B. never true
C. true for a unique voltage
D. true for a unique current

T.O. 87

A seat of emf is a term used to describe:

A. a place in a circuit where emf's congregate.

B. an area of low emf density in a circuit.

C. a low electrical potential in a circuit.

D. any source of emf.

T.O. 88

RR

In a circuit where the resistance of the elements is independent of the current, the heat developed

A. is directly proportional to current.

B. is proportional to current squared.

C. is inversely proportional to current.

D. is independent of the current.

T.O. 89

CR

Which of the following expresses the rate of heat loss from a circuit of known resistance R and voltage V?

A. VR

B. V/R

C. $V^2/R$

D. $V^2R$

T.O. 90

In a closed single loop circuit, where r is the internal resistance of the source, R is the circuit resistance, $i$ is current and ε is the emf of the source, which is an appropriate loop equation?

A. $-\varepsilon + ir = 0$

B. $\varepsilon + ir + iR = 0$

C. $\varepsilon - ir - iR = 0$

D. $\varepsilon + ir - iR = 0$

T.O. 91

In a parallel circuit with one of emf:

A. the voltage divides amongst the branch loops while the current is the same in all loops.

B. the current divides amongst the branch loops while the voltage drop across the loops is the same.

C. both the current and voltage divide in proportion to the resistance of the loops.

D. both the current and voltage divide in inverse proportion to the resistance of the loops.

T.O. 92

Kirchoff's second rule of electric networks states that the sum of all changes of potential in a circuit must be zero. This rule is implied by the conservation of:

A. momentum

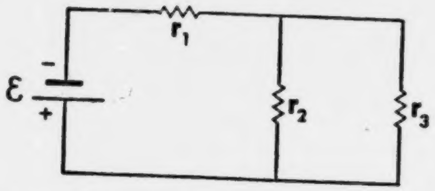
B. voltage

C. charge

D. energy

T.O. 93

The current through resistances $r_1$, $r_2$, and $r_3$ are respectively, $i_1$, $i_2$, $i_3$. Which is the correct expression for the voltage changes around the circuit?



A. $\varepsilon + i_1r_1 + i_1r_2 + i_1r_3 = 0$

B. $\varepsilon + i_1r_1 + i_2r_2 = 0$

C. $\varepsilon - i_1r_1 - i_1r_2 - i_1r_3 = 0$

D. $\varepsilon - i_1r_1 - i_2r_2 = 0$

---

T.O. 94

CU

The resistance of the ammeter should be _________ compared to other resistance in the circuit.

A. large

B. small

C. about the same

D. much larger

---

T.O. 95

A voltmeter is a galvanometer with a high resistance

A. in series with the meter and the combination (resistance-meter) is connected in series in the circuit.

B. in parallel with the meter and the combination (resistance-meter) is connected in series in the circuit.

C. in series with the meter and the combination (resistance-meter) is connected in parallel to the circuit branch.

D. in parallel with the meter and the combination (resistance-meter) is connected in parallel to the circuit branch.

T.O. 96

The Wheatstone bridge accurately determines the value of an unknown resistance by:

A. balancing its effect with that of a known resistance.

B. measuring the current through the resistance at a known voltage.

C. by elimination of the unknown and substitution of a known resistance in the circuit.

D. by bridging across the unknown resistance and measuring the results of its elimination from the circuit.

T.O. 97

RR

In the absence of gravitational and electric fields, if a particle of charge q and mass m is projected with a velocity $\vec{v}$ and observed no change in the particle's velocity, then we can say that

A. if there is a magnetic field it must be uniform

B. if there is a magnetic field it must be parallel to $\vec{v}$

C. if there is a magnetic field, it must be directed perpendicular to $\vec{v}$

D. if there is a magnetic field, it must be directed 45° to $\vec{v}$

T.O. 98

A proton (charge e and mass $m_p$) moving with a velocity $\vec{V} = V_o\hat{i}$ in the presence of a uniform magnetic field $\vec{B} = B_o\hat{j}$ experienced force $\vec{F}$ due to the magnetic field only. The magnitude of the force is

A. $e\ B_o\ V_o$

B. $e\ B_o\ V_o\ m_p$

C. $\frac{e}{m_p} B_oV_o$

D. $\frac{m_p}{e} B_oV_o$

T.O. 99 CR

A cube of side a is placed in a uniform magnetic field of magnitude B. The magnetic flux through the surface of the cube is

A. zero

B. 8 aB

C. 4 aB

D. $Ba^3$

T.O. 100 RR

A charge -q enters a magnetic field of magnitude B with speed v at an angle θ. The magnitude of the magnetic force on the charge is

A. zero

B. qvBsinθ

C. -qvBsinθ

D. -qvBcosθ

T.O. 101 RR

The vertical component of the Earth's magnetic field is generally directed

A. downward in the northern hemisphere and upward in the southern hemisphere

B. upward in the northern hemisphere and downward in the southern hemisphere

C. downward in both hemispheres

D. upward in both hemispheres

T.O. 102

CU

A conducting wire of length $\ell$ which carries a current $i$ in the positive x-direction is brought into a uniform magnetic field $\vec{B} = B\hat{i}$. The magnitude of the magnetic force on the wire is

A. $\ell B$

B. $iB$

C. zero

D. $i\ell B$

T.O. 103

CR

A rectangular loop of wire of sides a and b carrying a current $i$ lies in the x-y plane. If a uniform magnetic field $\vec{B} = B_1\hat{j} + B_2\hat{k}$ exists throughout the region, the magnitude of the torque acting on the loop is

A. $iab\ B_2$

B. $iab\ B_1$

C. $iab\ (B_1 + B_2)$

D. $i(a + b)\ (B_1 + B_2)$

T.O. 104

RR

A galvanometer is a

A. voltage measuring device

B. current measuring device

C. charge measuring device

D. heat measuring device

T.O. 105

RR

The magnitude of the magnetic moment $\mu$ of a small circular coil of radius r carrying current $i$ is

A. $4\pi r^2 i$

B. $\pi r^2 i$

C. $\frac{\pi r^2}{i}$

D. $\frac{i}{4\pi r^2}$

T.O. 106

CR

A proton is positively charged ($q_p = |q_e|$) and $m_p = 1836\ m_e$. A proton and an electron are released in the plane of the paper in the positive x-direction, there being a uniform magnetic field directed perpendicularly into the plane of the paper. Which of the following statements correctly describes the motion of the particles.

A. the electron rotates counterclockwise, the proton clockwise in the plane of the paper

B. both rotate clockwise in the plane of the paper

C. both rotate counterclockwise in the plane of the paper

D. the electron rotates clockwise, the proton counterclockwise in the plane of the paper

T.O. 107

RR

An infinitely long straight conductor carries a current $i$. The direction of the magnetic field at a point distant a from the conductor is

A. parallel to the wire and in the direction of the current

B. parallel to the wire and directed opposite to the current

C. normal to the conductor and directed inwards

D. tangent to a circle of radius a in a plane perpendicular to the wire

CR

An infinitely long straight conductor carries a current $i$. The magnitude of the magnetic field at a point distant d from the conductor is

A. independent of d

B. proportional to d

C. proportional to $\frac{1}{d}$

D. proportional to $\frac{1}{d^2}$

---

T.O. 109

PS

An infinitely long cylindrical wire of radius R carries a current I uniformly distributed over its cross section. The magnitude of the magnetic field B at a point inside the wire distant $r < R$ from the center of the wire is

A. $\frac{\mu_o I}{2\pi r}$

B. $\frac{\mu_o I}{2\pi r} \frac{r^2}{R^2}$

C. $\frac{\mu_o I}{2\pi} \frac{r}{R^2}$

D. $\frac{\mu_o I}{2\pi r} R^2$

---

T.O. 110

CR

Two current-carrying conductors are placed at distance d parallel to one another. The conductors carry the currents $i_1$ and $i_2$ in same directions. The force on conductor 1 due to conductor 2 is

A. proportional to $i_2$ only

B. proportional to $i_1$ only

C. proportional to both $i_1$ and $i_2$

D. independent of $i_1$ and $i_2$

T.O. 111

CU

In mks system of units, the unit of electric current the ampere is defined

A. using the concept of electric charge on an electron

B. using the concept of electric charge on a proton

C. using the concept of forces of attraction between long parallel current-carrying wires

D. using the concept of amount of electric charge crossing a given area per unit of time

---

T.O. 112

CU

For an ideal solenoid of length $\ell$ and radius R which has n turns per unit length and current $i$, the field outside of the solenoid is

A. proportional to n only

B. zero

C. proportional to $i$ only

D. proportional to both $i$ and n

---

T.O. 113

RR

According to the Biot-Savart law, the contribution to the magnetic field $d\vec{B}$ due to an element $d\vec{\ell}$ carrying current $i$ at a distance r is

A. $\frac{\mu_o i}{4\pi}\frac{d\vec{\ell} \times \vec{r}}{r^2}$

B. $\frac{\mu_o i}{4\pi}\frac{d\vec{\ell} \times \vec{r}}{r^3}$

C. $\mu_o i \frac{d\vec{\ell} \times \vec{r}}{r^2}$

D. $\mu_o i \frac{d\vec{\ell} \times \vec{r}}{r^3}$

T.O. 114 RR

The statement of the Faraday's law of induction in terms of magnetic flux, $\phi_B$, number of turns of the coil N and the emf $\varepsilon$ developed in the coil is

A. $\varepsilon = \frac{1}{N}\frac{d}{dt}\phi_B$

B. $\varepsilon = N\frac{d}{dt}\phi_B$

C. $\varepsilon = -N\frac{d\phi_B}{dt}$

D. $\varepsilon = -\frac{1}{N}\frac{d\phi_B}{dt}$

T.O. 115 RR

An induced emf is always such as to

A. aid the current producing it

B. oppose the change of the current producing it

C. aid the change of the current producing it

D. first aid and then oppose the change of current producing it

T.O. 116 CR

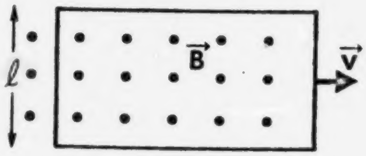
A closed conducting loop as shown in the diagram is being moved to the right at a constant speed v. If the loop has a total resistance R, then the current $i$ in the loop is

A. $B\ell v/R$, clockwise

B. $B\ell v/R$, counter clockwise

C. $B\ell v$, clockwise

D. $B\ell/vR$, clunter clockwise



T.O. 117

RR

The relationship between the inductance L of a coil which carries a current $i$ and flux linkage $N\phi_B$ caused by $i$ is

A. $L = N\phi_B/i$

B. $L = i/N\phi_B$

C. $Li = N\phi_B$

D. $L = N\phi_B i$

---

T.O. 118

CR

A long cylindrical solenoid of radius R and length $\ell$ has N turns. The inductance L of the solenoid is

A. $\frac{\mu_o \pi N R^2}{\ell}$

B. $\frac{\mu_o \pi N^2 R^2}{\ell}$

C. $\frac{\mu_o \pi N^2 R^2}{\ell^2}$

D. $\frac{\mu_o \pi N R^2}{\ell^2}$

---

T.O. 119

CU

When a emf is applied to a coil with a self inductance L and a resistance R causing the current to increase. The power delivered by the emf is partly dissipated by the resistance in amount $i^2R$ and partly stored in the field as

A. Mechanical energy

B. Joule heat

C. Electric energy

D. Magnetic energy

CU

A conducting wire of length $\ell$ which carries a current $i$ in the positive x direction is brought into a uniform magnetic field $\vec{B} = Bj$. The direction of the magnetic force on the wire is in

A. positive z-direction

B. negative z-direction

C. positive x-direction

D. positive y-direction

T.O. 121

RR

A resistor of resistance R and a capacitor of capacitance C are connected in series with a seat of emf ε. The charge q on the capacitor at the time t after the connection is made is

A. $C\varepsilon\, e^{-t/RC}$

B. $\frac{\varepsilon}{C}\, e^{-t/RC}$

C. $C\varepsilon\left(1 - e^{-t/RC}\right)$

D. $C\varepsilon\left(e^{-t/RC} - 1\right)$

T.O. 122

RR

The instant after a seat of emf ε is placed into an RC (where R is resistance and C is capacitance) circuit, the current flowing in the circuit will be approximately

A. $\frac{\varepsilon}{R}$

B. $.63\ \frac{\varepsilon}{R}$

C. $.37\ \frac{\varepsilon}{R}$

D. 0

T.O. 123

CR

The equation which represents the current $i$ during discharge of a capacitor C, charged to a potential ε, through a resistance R is:

A. $i = -\frac{\varepsilon}{R}$

B. $i = -\frac{\varepsilon}{R}\left(1 - e^{-t/RC}\right)$

C. $i = -\frac{\varepsilon}{R}\left(e^{-t/RC}\right)$

D. $i = -\frac{\varepsilon}{R}\left(1 - e^{-RC}\right)$

T.O. 124

CR

Which of the following equations expresses the current in an RL circuit (a resistance R, inductance L) with a source ε?

A. $i = \frac{\varepsilon}{R}\left(e^{-Rt/L}\right)$

B. $i = \frac{\varepsilon}{R}\left(e^{-t/RL}\right)$

C. $i = \frac{\varepsilon}{R}\left(1 - e^{-Rt/L}\right)$

D. $i = \frac{\varepsilon}{R}\left(1 - e^{-t/RL}\right)$

T.O. 125

RR

A resistor of resistance R and a inductor of inductance L are connected in series with a source of emf ε . After the equilibrium is reached, the source of emf is removed. The current in the circuit at the instant the source of emf is removed is

A. 0

B. $.37\,\frac{\varepsilon}{R}$

C. $.63\,\frac{\varepsilon}{R}$

D. $\frac{\varepsilon}{R}$

T.O. 126

CR

In an RL circuit, when the current is decaying the potential difference across the inductor is

A. $\varepsilon$

B. $-\varepsilon e^{-Rt/L}$

C. $\varepsilon\ 1 - e^{-Rt/L}$

D. $\varepsilon/R\ e^{-Rt/L}$

TEST ITEM STATISTICS FOR FALL, 1969 POSTTESTS
N APPROXIMATELY 150 ON EACH ITEM. BLANK
SPACES INDICATE MISSING DATA

| Volume | Item | Mean Proportion Correct | Mean Difficulty Rating by Faculty for Math | Mean Difficulty Rating by Faculty for Physics | Mean Recorded Student Confidence | Mean Difficulty Rating by Students | Point Biserial Correlation of Item x Total Test | Audio Visual Criteria | Learning Category |
|---|---|---|---|---|---|---|---|---|---|
| A | 1 | .39 | 1.75 | 2.8 | 93.69 | | .30 | | 1 |
| | 2 | .58 | 2.8 | 2.8 | 93.83 | | .44 | | 1 |
| | 3 | .50 | 1.5 | 2.7 | 87.85 | | .35 | | 0 |
| | 4 | .72 | 1.62 | 2.4 | 70.49 | | .27 | | 1 |
| | 5 | .51 | 1.0 | 2.5 | 91.33 | | .27 | | 0 |
| | 6 | .56 | 2.8 | 3.1 | 95.02 | | .47 | | 2 |
| | 7 | .52 | 2.4 | 2.4 | 89.12 | | .41 | | 1 |
| | 8 | .66 | 3.6 | 3.8 | 93.81 | | .33 | | 0 |
| | 9 | .33 | 3.1 | 3.6 | 81.44 | | .38 | | 2 |
| | 10 | .34 | 3.0 | 3.6 | 82.78 | | .32 | | 1 |
| | 11 | .49 | 2.7 | 3.0 | 87.85 | | .29 | | 1 |
| | 12 | .37 | 3.0 | 3.67 | 80.11 | | .44 | 1,2,3,4 | 1 |
| B | 1 | .97 | 1.0 | 2.0 | 97.51 | | .18 | 1,2,4 | 0 |
| | 2 | .93 | 2.0 | 2.4 | 97.65 | | .27 | 1,2 | 2 |
| | 3 | .48 | 1.8 | 3.2 | 90.66 | | .29 | | 3 |
| | 4 | .27 | 2.8 | 3.75 | 42.42 | | .31 | | 2 |
| | 5 | .29 | 3.0 | 4.0 | 71.45 | | .36 | | 2 |
| | 6 | .083 | 3.8 | 4.0 | 64.89 | | .07 | | 2 |
| | 7 | .25 | 3.2 | 3.2 | 74.42 | | .27 | | 3 |
| C | 1 | .89 | 1.8 | 2.6 | 96.75 | | .28 | 2,4 | 1 |
| | 2 | .54 | 4.0 | 3.4 | 79.65 | | .36 | 1,3,4 | 2 |
| | 3 | .93 | 2.2 | 2.8 | 93.64 | | .17 | | 1 |
| | 4 | .47 | 2.6 | 3.2 | 67.05 | | .53 | 1,2 | 2 |
| | 5 | .78 | 1.0 | 3.0 | 74.85 | | .40 | | 0 |
| | 6 | .84 | 1.6 | 2.8 | 72.65 | | .24 | 1,2 | 3 |
| | 7 | .11 | 3.2 | 3.3 | 48.52 | | .47 | | 1 |
| | 8 | .61 | 3.2 | 3.2 | 79.68 | | .57 | 1,2 | 1 |
| | 9 | .94 | 2.0 | 2.6 | 92.01 | | .20 | | 3 |
| | 10 | .15 | 2.4 | 3.8 | 75.14 | | .36 | | 1 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| D | 1 | .86 | 1.67 | 2.33 | 98.00 | 1.00 | .57 | | 1 |
| | 2 | .94 | 2.16 | 3.0 | 97.03 | 1.00 | .36 | 1,2 | 1 |
| | 3 | .68 | 3.16 | 3.16 | 77.79 | 1.50 | .49 | | 3 |
| | 4 | .63 | 3.0 | 3.16 | 88.41 | 3.00 | .49 | 1,2 | 1 |
| | 5 | .76 | 2.5 | 3.16 | 90.80 | 2.00 | .39 | 1,2 | 1 |
| | 6 | .72 | 2.83 | 3.0 | 92.98 | 3.00 | .39 | 1,2 | 3 |
| | 7 | .79 | 1.8 | 3.67 | 92.51 | 4.00 | .45 | 1,2 | 3 |
| | 8 | .42 | 3.16 | 3.33 | 96.30 | 3.00 | .34 | | 1 |
| | 9 | .74 | 3.16 | 3.5 | 91.99 | 5.00 | .49 | | 1 |
| E | 1 | .9 | 1.67 | 3.0 | 96.86 | 1.60 | .29 | | 0 |
| | 2 | .87 | 2.0 | 2.75 | 96.79 | 1.94 | .35 | | 0 |
| | 3 | .58 | 2.33 | 3.0 | 92.84 | 2.57 | .51 | | 3 |
| | 4 | .53 | 2.75 | 3.0 | 82.40 | 3.54 | .47 | | 2 |
| | 5 | .78 | 1.67 | 3.5 | 88.84 | 2.65 | .45 | | 0 |
| | 6 | .51 | 2.67 | 3.0 | 74.43 | 3.20 | .50 | | 3 |
| | 7 | .59 | 2.25 | 3.25 | 82.94 | 3.43 | .39 | | 2 |
| | 8 | .46 | 3.0 | 3.75 | 68.93 | 4.18 | .55 | | 1 |
| | 9 | .10 | 2.75 | 3.75 | 54.15 | 4.35 | .29 | | 1 |
| | 10 | .17 | 3.5 | 4.25 | 48.69 | 3.80 | .27 | | 3 |
| F | 1 | .87 | 1.5 | 2.0 | 95.05 | 1.89 | .38 | | 1 |
| | 2 | .95 | 1.33 | 2.33 | 91.85 | 2.31 | .29 | | 1 |
| | 3 | .97 | 1.00 | 3.0 | 98.46 | 1.37 | .21 | | 0 |
| | 4 | .82 | 2.125 | 2.78 | 89.50 | 2.65 | .40 | | 3 |
| | 5 | .56 | 1.78 | 2.33 | 85.93 | 2.87 | .52 | | 1 |
| | 6 | .76 | 2.89 | 3.22 | 82.96 | 3.23 | .52 | | 2 |
| | 7 | .90 | 1.00 | 3.42857 | 96.97 | 1.93 | .39 | | 1 |
| | 8 | .93 | 1.33 | 2.875 | 98.09 | 1.88 | .15 | | 3 |
| | 9 | .53 | 1.00 | 3.5 | 90.95 | 2.92 | .48 | | 3 |
| | 10 | .12 | 3.167 | 3.42857 | 55.99 | 4.35 | .26 | | 2 |
| G | 1 | .78 | 1.00 | 2.5 | 92.15 | 2.46 | .46 | | 0 |
| | 2 | .68 | 2.5 | 3.0 | 88.40 | 3.03 | .53 | | 1 |
| | 3 | .51 | 2.5 | 3.0 | 79.18 | 3.31 | .47 | | 1 |
| | 4 | .49 | 2.5 | 4.0 | 70.65 | 3.94 | .52 | | 1 |
| | 5 | .61 | 1.0 | 3.0 | 73.15 | 3.16 | .53 | | 1 |
| | 6 | .67 | 1.0 | 2.5 | 81.77 | 2.75 | .49 | 1,2 | 0 |
| | 7 | .73 | 1.5 | 2.5 | 81.68 | 3.37 | .60 | | 1 |
| | 8 | .50 | 3.0 | 4.0 | 76.11 | 3.74 | .63 | | 2 |
| | 9 | .31 | 4.0 | 4.5 | 74.55 | 3.87 | .40 | | 2 |
| | 10 | .20 | 3.5 | 4.0 | 32.39 | 4.63 | .37 | 1,2 | 2 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| H | 1 | .99 | 2.42857 | 2.42857 | | | -.04 | | 1 |
| | 2 | .70 | 3.28571 | 3.14286 | | | .30 | | 2 |
| | 3 | .52 | 1.8 | 2.57 | | | .19 | | 0 |
| | 4 | .99 | 1.83 | 2.42857 | | | .04 | | 2 |
| | 5 | .64 | 2.71 | 2.85714 | | | .54 | | 1 |
| | 6 | .39 | 2.71 | 2.57 | | | .33 | | 1 |
| | 7 | .91 | 1.71429 | 3.0 | | | .24 | | 3 |
| | 8 | .89 | 2.14 | 1.86 | | | .31 | | 1 |
| | 9 | .79 | 2.28 | 3.0 | | | .33 | | 1 |
| | 10 | .92 | 1.28 | 1.86 | | | .39 | | 1 |
| | 11 | .89 | 2.71 | 3.0 | | | .24 | | 1 |
| | 12 | .28 | 2.857 | 3.0 | | | .37 | | 1 |
| | 13 | .67 | 2.0 | 3.125 | | | .37 | | 1 |
| | 14 | .71 | 2.83 | 3.28571 | | | .50 | | |
| | 15 | .15 | 2.83 | 3.86 | | | .35 | | 1 |
| | 16 | .80 | 2.57 | 2.57 | | | .39 | | 1 |
| | 17 | .83 | 1.857 | 2.29 | | | .31 | | 1 |
| | 18 | .43 | 3.0 | 3.28 | | | .52 | | 1 |
| | 19 | .69 | 1.57 | 2.71 | | | .48 | | 1 |
| | 20 | .21 | 2.43 | 3.57 | | | .30 | | 1 |
| I | 1 | 1.0 | 1.0 | 2.22 | 98.80 | 1.26 | .0 | 2,3 | 0 |
| | 2 | .77 | 2.78 | 3.22 | 93.95 | 2.49 | .31 | 2,3 | 1 |
| | 3 | .99 | 1.8 | 2.83 | 97.67 | 2.04 | .16 | | 0 |
| | 4 | .71 | 3.11 | 3.67 | 87.85 | 3.06 | .53 | | 2 |
| | 5 | .76 | 1.0 | 3.0 | 92.20 | 2.35 | .31 | | 0 |
| | 6 | .61 | 2.89 | 3.44 | 72.38 | 3.47 | .61 | 2,3,4 | 2 |
| | 7 | .78 | 3.28 | 3.5 | 80.82 | 3.45 | .49 | | 1 |
| | 8 | .78 | 2.0 | 3.44 | 88.45 | 2.72 | .53 | | 0 |
| | 9 | .93 | 1.0 | 2.5 | 95.26 | 2.24 | .28 | 2,3,4 | 0 |
| | 10 | .77 | 2.67 | 3.11 | 90.43 | 3.30 | .56 | | 0 |
| J | 1 | .27 | 1.67 | 2.75 | 94.59 | 1.59 | .30 | | 0 |
| | 2 | .89 | 1.8 | 2.167 | 96.19 | 2.11 | .27 | | 1 |
| | 3 | .55 | 3.5 | 3.25 | 87.95 | 3.30 | .56 | | 3 |
| | 4 | .45 | 2.167 | 2.83 | 77.46 | 3.10 | .44 | | 3 |
| | 5 | .73 | 2.167 | 2.83 | 82.84 | 3.02 | .59 | | 1 |
| | 6 | .71 | 2.5 | 3.33 | 90.30 | 3.18 | .55 | | 1 |
| | 7 | .75 | 1.83 | 2.5 | 90.06 | 3.06 | .54 | 2,3 | 1 |
| | 8 | .79 | 1.75 | 2.4 | 87.32 | 3.11 | .52 | 2,3 | 1 |
| | 9 | .63 | 2.29 | 3.5 | 79.92 | 3.57 | .63 | | 1 |
| | 10 | .06 | 4.0 | 4.5 | 53.11 | 4.43 | .35 | | 1 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| K | 1 | .94 | 2.875 | 3.5 | 94.05 | 2.17 | .15 | | 1,2 |
| | 2 | .98 | 2.125 | 2.75 | 99.09 | 1.61 | | | 1,0 |
| | 3 | .93 | 1.43 | 3.25 | 98.85 | 2.12 | .22 | | 1.1 |
| | 4 | .93 | 1.625 | 2.125 | 83.65 | 2.55 | .33 | | 1,1 |
| | 5 | .85 | 1.0 | 2.57 | 85.79 | 2.93 | .42 | | 0,1 |
| | 6 | .85 | 2.125 | 2.875 | 83.96 | 3.37 | .47 | | 1,2 |
| | 7 | .94 | 2.375 | 2.875 | 96.41 | 2.50 | .24 | | 1,1 |
| | 8 | .85 | 1.5 | 2.625 | 99.34 | 2.07 | .08 | | 1,1 |
| | 9 | .69 | 1.0 | 2.28 | 91.99 | 3.21 | .53 | | 0,2 |
| | 10 | .86 | 2.25 | 3.0 | 91.00 | 2.70 | .45 | | 2,0 |
| L | 1 | .92 | 1.8 | 2.43 | 94.74 | 2.00 | .41 | | 0,1 |
| | 2 | .33 | 2.0 | 2.857 | 89.56 | 2.73 | .20 | | 1,2 |
| | 3 | .28 | 1.0 | 3.6 | 83.65 | 3.20 | .27 | 3,4 | 3,2 |
| | 4 | .68 | 1.0 | 2.2 | 87.57 | 2.78 | .44 | | 2,0 |
| | 5 | .83 | 1.0 | 2.33 | 91.57 | 2.67 | .34 | | 2,2 |
| | 6 | .76 | 1.0 | 2.0 | 83.42 | 3.00 | .51 | | 3,0 |
| | 7 | .82 | 2.0 | 2.714 | 90.61 | 3.27 | .54 | | 2 |
| | 8 | .73 | 3.0 | 3.0 | 92.70 | 2.63 | .51 | | 2,0 |
| | 9 | .72 | 2.14 | 3.14 | 92.97 | 2.82 | .45 | | 2,0 |
| | 10 | .73 | 1.00 | 2.0 | 81.58 | 3.89 | .36 | | 0,2 |
| M | 1 | .43 | 1.0 | 3.5 | 77.65 | 2.95 | .46 | 2,3 | 0 |
| | 2 | .44 | 1.5 | 3.0 | 78.42 | 3.21 | .36 | | 0 |
| | 3 | .66 | 1.0 | 2.2 | 90.10 | 2.48 | .33 | | 0 |
| | 4 | .58 | 2.33 | 3.2 | 88.33 | 3.14 | .37 | 1,2,3,4 | 0 |
| | 5 | .51 | 1.0 | 2.8 | 78.86 | 3.22 | .40 | | 1 |
| | 6 | .43 | 1.8 | 2.8 | 82.51 | 3.34 | .44 | | 1 |
| | 7 | .61 | 1.33 | 3.2 | 74.41 | 3.53 | .31 | | 0 |
| | 8 | .84 | 1.0 | 1.8 | 84.97 | 2.99 | .30 | | 0 |
| | 9 | .39 | 2.6 | 3.6 | 82.50 | 3.75 | .42 | | 1 |
| | 10 | .47 | 2.75 | 3.0 | 77.19 | 3.84 | .15 | | 1 |
| N | 1 | .66 | 1.0 | 2.5 | 91.55 | 2.49 | .44 | | 0 |
| | 2 | .32 | 1.4 | 3.33 | 56.84 | 3.82 | .35 | 2,3,4 | 2 |
| | 3 | .22 | 3.167 | 3.67 | 84.70 | 3.37 | .28 | 2,3,4 | 2 |
| | 4 | .76 | 3.0 | 3.33 | 81.07 | 3.57 | .50 | 1,2,3,4 | 2 |
| | 5 | .82 | 2.25 | 3.33 | 83.48 | 3.43 | .36 | 1,2,3,4 | 2 |
| | 6 | .49 | 2.33 | 3.167 | 72.82 | 3.88 | .57 | | 1 |
| | 7 | .16 | 3.2 | 3.6 | 52.31 | 4.15 | .36 | | 2 |
| | 8 | .42 | 3.6 | 3.4 | 75.10 | 4.00 | .53 | | 2 |
| | 9 | .21 | 1.0 | 3.4 | 74.69 | 3.49 | .21 | | 0 |
| | 10 | .40 | 3.0 | 3.4 | 59.62 | 4.03 | .34 | | 2 |

|  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|
| 0 | 1 | .92 | 2.0 | 2.67 | 87.57 | 2.53 | .32 | 1 |
|  | 2 | .70 | 2.167 | 2.67 | 77.10 | 3.12 | .62 | 1 |
|  | 3 | .36 | 2.83 | 3.67 | 70.65 | 3.45 | .49 | 1 |
|  | 4 | .71 | 2.167 | 2.67 | 80.08 | 3.10 | .56 | 2 |
|  | 5 | .41 | 3.33 | 3.2 | 70.52 | 3.71 | .57 | 1 |
|  | 6 | .37 | 1.75 | 3.0 | 71.96 | 3.29 | .35 | 1 |
|  | 7 | .72 | 1.83 | 2.8 | 66.32 | 3.48 | .46 | 1 |
|  | 8 | .20 | 3.5 | 4.0 | 52.09 | 3.96 | .42 | 1 |
|  | 9 | .44 | 2.0 | 3.0 | 60.13 | 3.75 | .46 | 1 |
|  | 10 | .33 | 3.0 | 3.0 | 56.72 | 3.99 | .45 | 1 |

Name ______________________ Date 6 September 1969

Section Number ____ Physics -- S211

## VOLUME A PRE-TEST.

1. Express the product of 100.10 and 00.3 to the proper number of significant figures.

TO

003 100.10 × 00.3 = 30 %

2. A boat crosses a stream which is 12 miles wide. During the crossing the water carries it 5 miles downstream. The boat's total displacement is:

TO

004 13.4 miles at a downstream angle of 22.6 degrees with a line perpendicular to the stream. %

3. The following incomplete statement refers to *length* and *time*. Complete the appropriate statement by adding one of the words: LENGTH, TIME or BOTH.

TO

002 Both is a relative quantity.
are relative quantities. %

4. The equation of motion for a body subject to air resistance is

TO

008

$$x = \frac{v_o}{k}(1 - e^{-kt}) ,$$

where x is the position of the body,

$x_o$ is the initial position,

$v_o$ is the initial speed,

t is the elapsed time, and

k is a constant.

The dimensions of k are

$T^{-1}$ %

Name ______________________ Date 6 September 1969

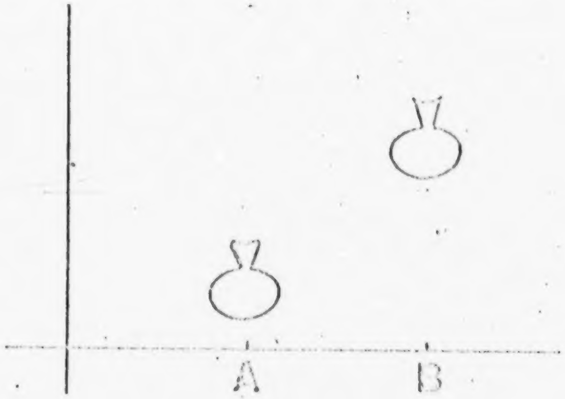
Section Number ______

VOLUME A PRE-TEST
(Physics — S211)

5. A vase is moved from position A to position B as shown below. This motion is called: (one word)

TO

005



| translation |
|---|

%

6. A particle moves according to the equation $y = 4t^2$ (where y is given in feet). What is the velocity of the particle at $t = 2$ s? (include units)

TO

011

16 ft/s in the positive y-direction.

%

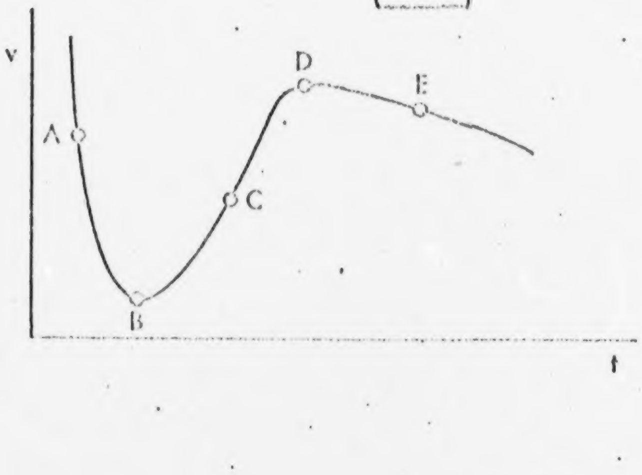
7. In the figure, the velocity of a particle is plotted as a function of time. Of the points labeled by alphabetic letters on the graph, select the one at which the acceleration is maximum.

TO

007

C

%



Name ____________________ Date 6 September 1969

Section Number ______

VOLUME A PRE-TEST
(Physics -- S211)

8. The distance between point A and wall B is 4000 ft. A car can develop a maximum deceleration of 15 ft/s$^2$. The maximum speed the driver attains, starting from rest at A, is 300 ft/s. How far can he travel before beginning to apply his brakes? (Assume instantaneous changes of acceleration, and include units in your answer.)

TO
006

1000 ft

%

9. An aircraft carrier proceeds due north (N) at 30 knots and a truck moves abeam the carrier, from port to starboard, at 30 knots. Find the truck's velocity relative to the water. (Use E for east, S for south and W for west.)

TO
010

speed: $\sqrt{1800}$ knots

direction: 45 degrees N of E

%

10. A stone is thrown vertically downward from the top of a cliff 39.6 m high. Two seconds later the stone hits the ground at the bottom of the cliff. What was the initial speed of the stone (include units)?

TO
009

10 m/s

%

11. A baseball is batted with an initial velocity v = 40 ft/s, at 60° above the horizontal. How far from the batter will it land? (Neglect air resistance and assume a level field.)

TO
012

43.3 ft

%

12. For the baseball of question 11, what is the initial speed in the MKS system of units (include units).

TO
001
001

12.19 m/s

%

Name ______________________________ Date 13 September 1969

Section Number _____ Physics -- S211

VOLUME A POST-TEST

1. Use the proper number of significant figures in writing the sum

$$91.4 + 0.009 + 202.0 + 3000 .$$

Sum = ☐ . %☐

2. A plane travels 60 miles due north. It then turns due west and travels for 25 miles. The total displacement of the plane is

☐ miles in a direction of %☐

☐ degrees west of north. %☐

3. The following incomplete statement refers to length and time. Complete the appropriate statement by adding one of the words: LENGTH, TIME, BOTH or NEITHER.

☐ is an absolute quantity. %☐

are absolute quantities.

4. The acceleration of a body is given by

$$a = \alpha + \beta t ,$$

where $\alpha$ and $\beta$ are constants.

The dimensions of $\alpha$ and $\beta$ are

☐ and %☐

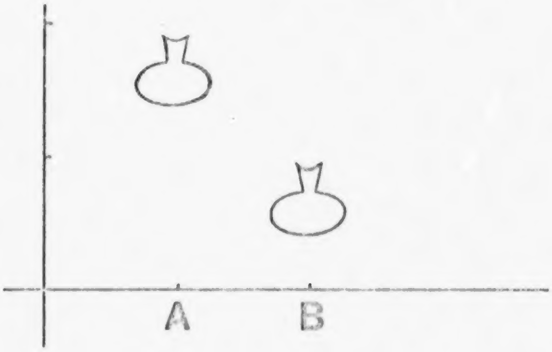
☐ , respectively %☐

Name ______________________ Date 13 September 1969

Section Number _____ VOLUME A POST-TEST

(Physics -- S211)

5. A vase is moved from position A to position B as shown below. This motion is called (one word):



[ __________ ]

% [ ____ ]

6. A particle moves on the x-axis with a velocity given by (written in scalar form)

$$v = 15t - 8t^2 \qquad \text{(in m/s)} .$$

At t = 1 s the particle's acceleration is (include units)

[ ______ ] in the [ ______ ] x-direction. % [ ____ ]

7. The acceleration of the particle in question 6 at t = 1 expressed in the British engineering system of units is

[ ______ ] $ft/s^2$ % [ ____ ]

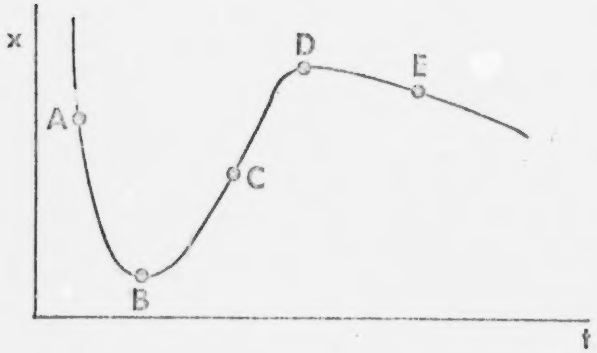
Name ______________________________

Section Number _____

Date 13 September 1969

VOLUME A POST-TEST
(Physics -- S211)

8. In the figure the displacement of a particle is plotted as a function of time. Of the points labeled by alphabetic letters on the graph, select the one at which the velocity is minimum.



%

9. The runway of an airport is 3000 ft long. A cargo plane starts from one end of the runway and develops a constant acceleration of 2 $ft/s^2$. Fifty seconds after the start the pilot notices some defect and immediately applies the brakes. Assuming instantaneous change of acceleration, what is the minimum (constant) acceleration that must be applied for the plane to stop on the runway?

%

10. A stone is thrown vertically upward from a point 2 m above ground. Two seconds later the stone has an altitude of 20 m and is still ascending. What is the initial speed of the stone?

m/s

%

Name ______________________ Date 13 September 1969

Section Number _____ VOLUME A POST-TEST

(Physics -- S211)

11. A boat must go directly across a river with a speed of 5 knots relative to ground. If the water velocity is 2 knots downstream, what must be the velocity of the boat relative to water.

☐ knots in an upstream angle of %☐

☐ degrees from the line normal to the stream %☐

12. A projectile is fired with a velocity of 200 ft/s at an angle of 53° above the horizontal. How long does it take the projectile to reach its maximum altitude?

☐ s %☐

Name KEY

Date 13 September 1969

Section Number ______

Physics — S211

## VOLUME B PRE-TEST

1. A puck is set in motion on a frictionless horizontal table with a speed of 32 ft/s. After two seconds the speed of the puck is

TO 013

32 ft/s

%

2. A force of 6 N applied to a block causes it to accelerate at 5 $m/s^2$. What is the force necessary to cause an acceleration of 15 $m/s^2$ on the same block?

TO 014

18 N

%

3. Near the surface of the moon objects fall with an acceleration of 1.6 $m/s^2$. What is the mass of an object on the moon if its weight on earth is 98 N? (Include units.)

TO 015

10 kg

%

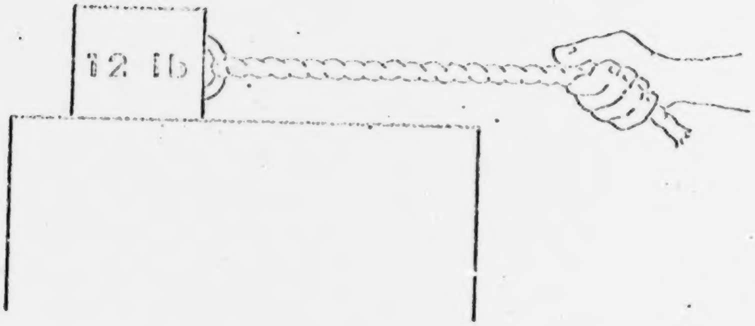
4. A section of roadway has a radius of curvature of 320 ft and is designed to handle traffic at 64 ft/s. What minimum coefficient of friction prevents skids at this speed?

TO 019

0.4

%

5.



A 12 lb block rests on a horizontal surface. The block is tied to a rope and a horizontal force of magnitude 5 lb is applied to the other end of the rope by the shown hand. If the block remains stationary, what is the magnitude of the total reaction force applied by the horizontal surface on the block.

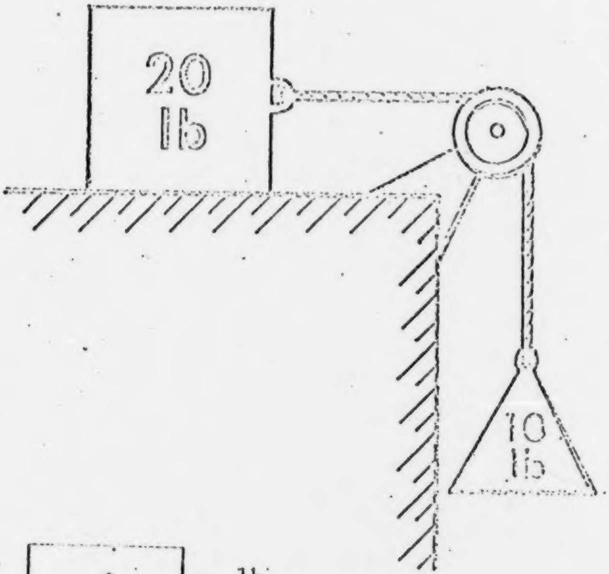
TO
016

12.8 - 13.2

| 13 | lb |
|---|---|

☐ %

6. A 20 lb weight slides along a table according to the arrangement shown in the diagram. The coefficient of kinetic friction between the table and the block is 0.20. What is the magnitude of the net force that accelerates the block on the table?



TO
017

| 8 | lb |
|---|---|

☐ %

Name ______________________________

Date 13 September 1969

Section Number ______

VOLUME B PRE-TEST
(Physics — S211)

7. A 2-kg object is moving on a circular path of radius 3 m and completes 15 revolutions per minute. What is its centripetal acceleration? (Include units.)

TO
018

$\boxed{7.4 \ \frac{\text{meters}}{\text{sec}^2}}$ or $\frac{4\pi^2}{3}$ meters/sec$^2$ ☐ %

Physics S211 Date 13 September 1969

# ANSWERS

# TO

# VOLUME B PRE-TEST

| *Question* | *Terminal Objective* | *Answer* |
|---|---|---|
| 1 | 013 | 32 ft/s |
| 2 | 014 | 18 N |
| 3 | 015 | 10 kg |
| 4 | 019 | 0.4 |
| 5 | 016 | 13 lb |
| 6 | 017 | 8 lb |
| 7 | 018 | 7.4 $m/s^2$ |

NAME K E Y DATE 20 September 1969

Student I.D. Number Section Number

## VOLUME B POST-TEST

### Physics — S211

1. At time t=0, a puck is observed to move on a frictionless horizontal table with a speed of 40 ft/s. After two seconds the speed of the puck is

TO
013

40 ft/s ☐ %

2. A force of 6 N applied to a block causes it to accelerate at 5 $m/s^2$. If the mass of the block is tripled and the same force is applied, what will be the acceleration of the block?

TO
014

1.67 $m/s^2$ ☐ %

3. Near the surface of the moon objects fall with an acceleration of 1.6 $m/s^2$. What is the mass of an object on the moon if its weight on earth is 128 lbs? (Include units.)

TO
015

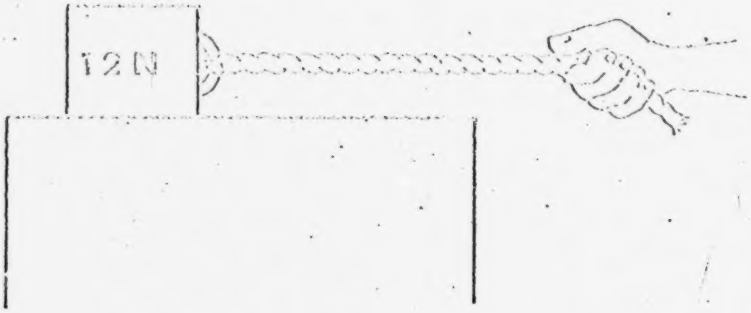
4 slugs ☐ %

4. A section of level roadway has a radius of curvature of 100 m and is expected to handle traffic at 10 m/s. What minimum coefficient of friction prevents skids at this speed?

TO
019

.102 ☐ %

5.

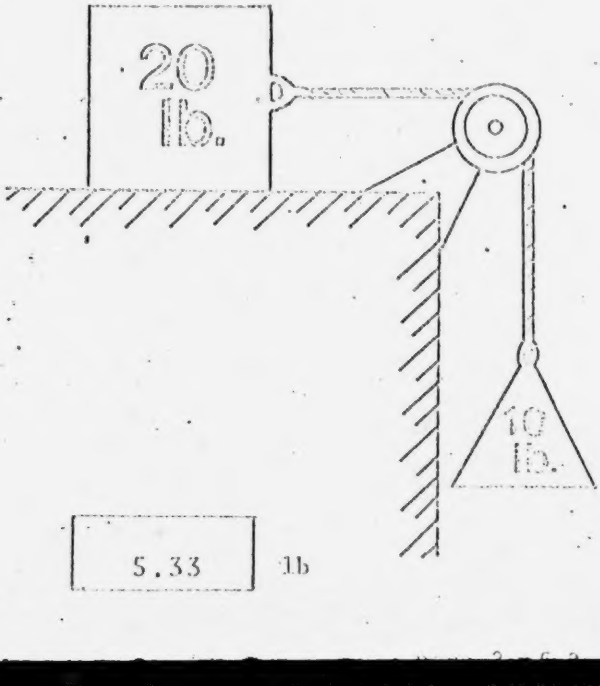


A 12 N block rests on a horizontal surface. The block is tied to a rope and a horizontal force of magnitude 5 N is applied to the other end of the rope by the shown hand. If the block remains stationary, what is the magnitude of the *total* reaction force applied by the horizontal surface on the block?

TO
16

| | | | |
|---|---|---|---|
| 13 | N | | % |

6. A 20 lb weight slides to the right along a table according to the arrangement shown in the diagram. The coefficient of kinetic friction between the table and the block is .10. What is the magnitude of the net force that accelerates the block on the table?



TO
17

| | | | |
|---|---|---|---|
| 5.33 | lb | | % |

NAME ______________________________

7. A 2-kg object is moving on a circular path of radius 3 m and completes one revolution every minute. What is its centripetal acceleration? (Include units.)

TO
018

$\boxed{.132\ \mathrm{m/s^2}}$ ☐ %

Name K E Y

Section Number ____

Student ID No. ____________

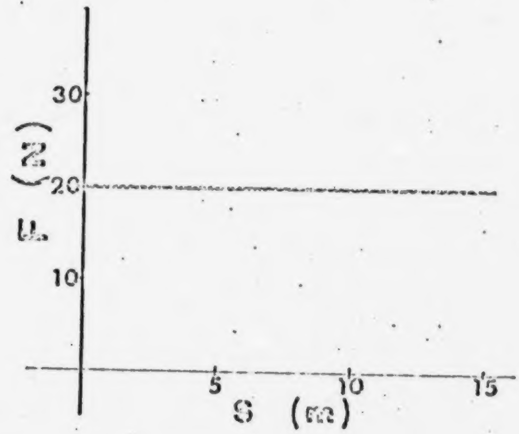
Date 20 September 1969

Physics -- S211

VOLUME C PRE-TEST

1. The diagram shows how a force applied to a 5 kg object varies with the displacement of the object. Calculate the work done by this force in moving the object from the origin to 2 = 10 m (include units).

TO 020

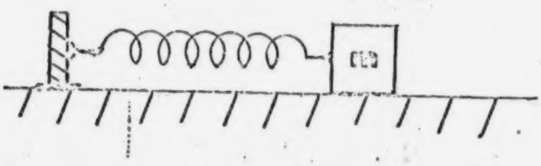


$\boxed{\text{200 J(oules)}}$

☐ %

2. The equation giving the force provided by a deformed spring is given by

$$F = -kx \qquad (1)$$



where k is a constant. (Equation (1) is valid only for the case in which the equilibrium position - unstretched spring - is at the origin). Using (1) derive the expression for the work done by a spring of force constant k in moving an object of mass m from position $x_1$ to position $x_2$.

TO 021

$\boxed{\frac{1}{2} k(x_1^2 - x_2^2)}$

☐ %

Name ______________________________

Date 20 September 1969

Section Number ____

VOLUME C PRE-TEST
(Physics --- S211)

3. A constant force of magnitude 100 N is required to move a 50 kg block along a horizontal floor with constant speed of 4 m/s. The force is directed along the motion of the block. Calculate the power delivered by this force. (Include units.)

TO
022

400 W(atts)

☐ %

4. How much work must be done on a 3 kg body moving with a speed of 2 m/s in order to double its speed?

TO
023

18 J

☐ %

5. If the work done by a force on an object, in moving the object through a closed path, is zero the force is called

TO
024

conservative

☐ %

6. A 2 lb body is attached to a spring and at a certain instant its kinetic energy is equal to its (elastic) potential energy. Its total energy at that instant is equal to 10 ft-lb. Some time later its kinetic energy has doubled. What is the value of its potential energy at that time?

TO
025

zero

☐ %

Name ______________________ Date 20 September 1969

Section Number ________ VOLUME C PRE-TEST
(Physics --- S211)

7. A body is subject to a two dimensional potential energy given by the expression

$$U(x,y) = 2x^2 + 3y^3$$

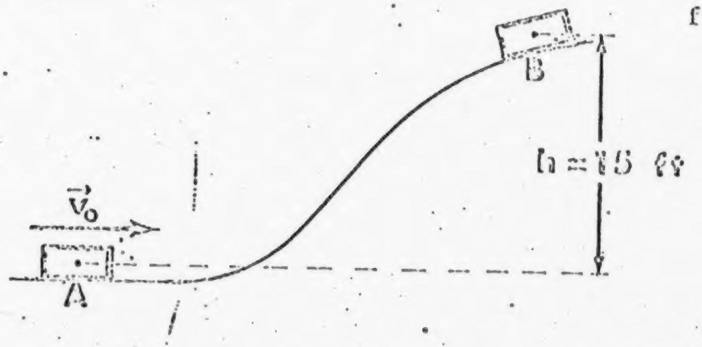
The expression giving the x-component of the force experienced by this body is:

TO
026

| 4x |
|---|

|   | % |
|---|---|

8. At point A a roller coaster moves with a speed of 32 ft/s. What will be the speed of the coaster when it reaches a height of 15 feet relative to the level of A (point B)? (Neglect friction.)



TO
027

| 8 | ft/s |
|---|---|

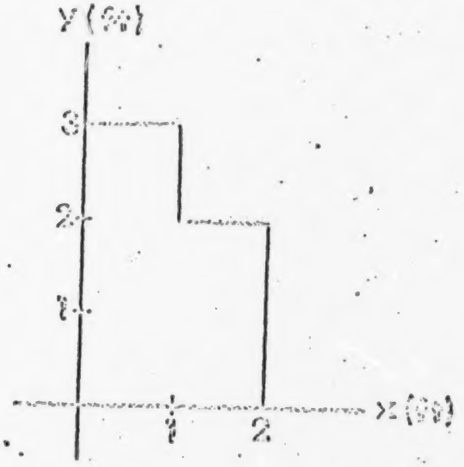
|   | % |
|---|---|

Name ______________________ Date 20 September 1969

Section Number ________

VOLUME C PRE-TEST
(Physics — S211)

9. The x- and y-coordinates of the center of mass of the two dimensional object shown in the diagram are, respectively

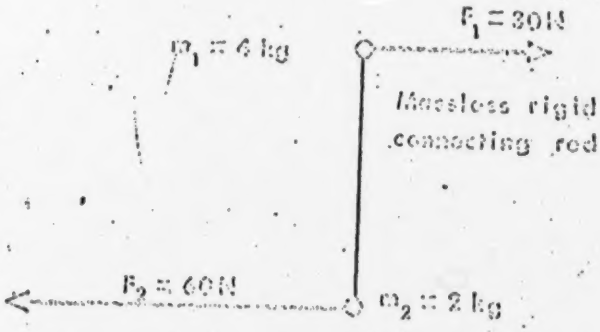


Y (ft)
3
2
1
1
2
X (ft)

TO
028

| | | | |
|---|---|---|---|
| 0.9 | ft. | | % |
| 1.3 | ft | | % |

10. For the system of masses and forces shown in the diagram, the acceleration of the center of mass is (include units)



$m_1 = 4$ kg
$F_1 = 30N$
Massless rigid connecting rod
$F_2 = 60N$
$m_2 = 2$ kg

TO
029

| | |
|---|---|
| 5 m/s$^2$ | % |

Name ____________________ Section Number ______

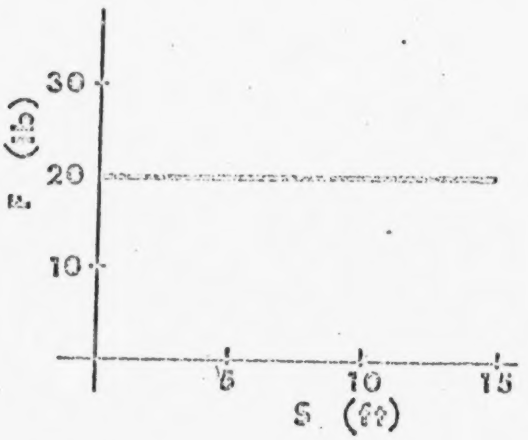
Student ID Number ________ Group Letter ________

KEY

Physics S211 Date 27 September 1969

VOLUME C POST-TEST

1. The diagram shows how a force applied to a 5-lb object varies with the displacement of the object. Calculate the work done by this force in moving the object from the origin to s = 10 ft (include units).



TO 020

200 ft. lb.

☐ %

2. The magnitude of a force applied to a block is directly proportional to the magnitude of the block's displacement (F = ks, where k is a constant). Furthermore, the force is directed along the block's displacement ($F_s = F$). Derive an expression for the work done by this force in moving the block from position $s_1$ to position $s_2$.

TO 021

W = $\boxed{1/2k\ (S_2{}^2 - S_1{}^2)}$

☐ %

3. A constant force of magnitude 100 lb is required to move a block along a horizontal floor with constant speed of 4 ft/s. The force is directed along the motion of the block. Calculate the power delivered by this force.

TO 022

400 ft-lb/s

☐ %

NAME ______________________ VOLUME C POST-TEST

4. How much work must be done on a 3-slug body moving with a speed of 2 ft/s in order to double its kinetic energy?

|  |  |  |  |
|---|---|---|---|
| TO<br>023 | 6 | ft-lb | ☐ % |

5. If the work done by a force on an object in moving the object through a closed path is zero, the force is called

|  |  |  |
|---|---|---|
| TO<br>024 | conservative | ☐ % |

6. A 2-kg body attached to a spring slides back and forth on a frictionless horizontal surface. At a certain instant its kinetic energy is equal to its (elastic) potential energy, each being equal to 5 J; i.e., its total energy at that instant is equal to 10 J. Some time later its kinetic energy has doubled. What is the value of its potential energy at that time?

|  |  |  |  |
|---|---|---|---|
| TO<br>025 | 0 | J | ☐ % |

NAME ______________________________ VOLUME C POST-TEST

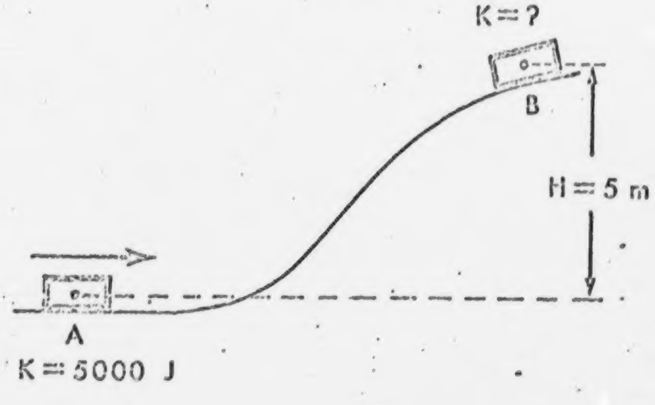
7. A body is subject to a one-dimensional potential energy given by the expression

$$U(x) = kx^2,$$

where k is a constant. The expression giving the force experienced by this body is:

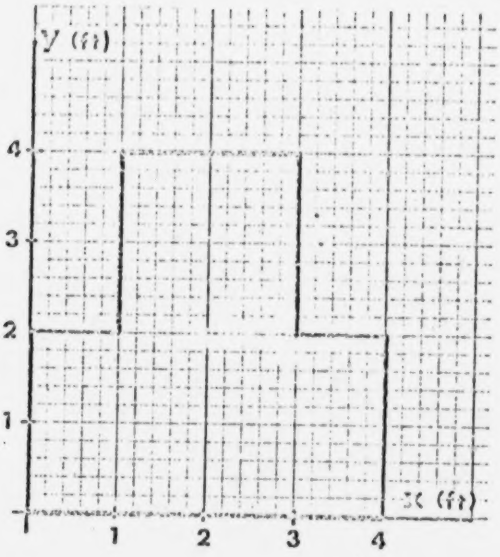
TO 026 F = -2kx ☐ %

8. At point A a 100-kg roller coaster has a kinetic energy equal to 5000 J. What will be the kinetic energy of the coaster when it reaches a height of 5 m relative to the level of A (point B)? (Neglect friction.)



TO 027 100 J ☐ %

9.


y (ft)
4
3
2
1
1
2
3
4
x (ft)

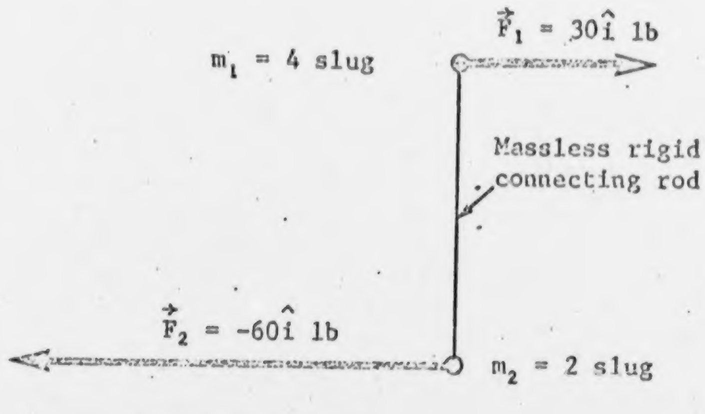
A two-dimensional view of a plywood plate is shown in the diagram. The plywood is homogeneous and of uniform thickness. Locate the x-coordinate of the center of mass of this plate.

$x_{cm}$ = 2 ft

☐ %

TO
028

10. For the system of masses and forces shown in the diagram, the acceleration of the center of mass is


$\vec{F}_1 = 30\hat{i}$ lb
$m_1$ = 4 slug
Massless rigid connecting rod
$\vec{F}_2 = -60\hat{i}$ lb
$m_2$ = 2 slug

TO
029

$\vec{a}_{cm}$ = $-5\hat{i}$ ft/s²

☐ %

Name ______________________ Section Number ____

Student ID Number __________ Group Letter ______

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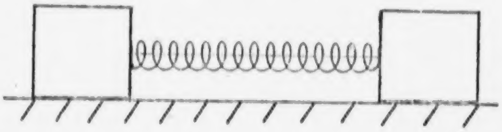
Physics S211 Date 27 September 1969

## VOLUME D PRE-TEST

1. An object moving with a speed of 2 ft/s has a momentum of magnitude 4 slug-ft/s. What is the mass of the object? (Include units.)

☐ ☐ %

2. Two blocks with masses of 4 kg and 2 kg, respectively, rest on a frictionless horizontal table. A compressed spring is placed between the two blocks but is not attached to either of the blocks. A string tied to the blocks keeps them from flying apart. Suddenly the string breaks and the 4-kg block is observed to move toward left with a speed of 4 m/s. The 2-kg block is moving toward right with a speed of



☐ m/s ☐ %

3. The following expression gives the net external force applied to a body whose mass is changing:

$$\vec{F}_{ext} = m\frac{d\vec{v}}{dt} + \vec{v}\frac{dm}{dt} .$$

This equation is derived directly from Newton's

☐ law of motion. ☐ %

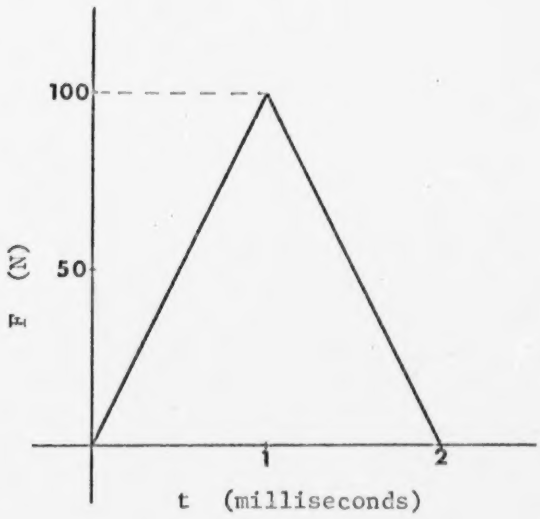
4. A 2-kg body is moving toward the positive x-direction with a speed of 3 m/s. An impulsive force applied to this body causes it to change its velocity to 2 m/s toward the negative x-direction. The magnitude of the impulse imparted to the body is (include units)

☐ ☐ %

5. An impulsive force applied to a body for a duration of 5 milliseconds (1 ms = $10^{-3}$ s) imparts to the body an impulse of magnitude 2 lb-s. If the direction of the force remains constant during this time interval, what is its average magnitude?

☐ lb ☐ %

6. The diagram shows the dependence of the force applied by a mallet to a croquet ball during the time of contact. Calculate the total impulse imparted to the croquet ball by the mallet.



☐ N-s

☐ %

Name ______________________ VOLUME D PRE-TEST

7. Consider the following statements:

   A. In each and every collision momentum is conserved.

   B. Momentum is conserved only if the collision is perfectly elastic.

   C. In a perfectly elastic collision both momentum and kinetic energy are conserved.

   D. In a perfectly inelastic collision kinetic energy is conserved but momentum is not.

   E. Whereas conservation of momentum holds true for perfectly elastic collisions, conservation of kinetic energy for such collisions is conditional.

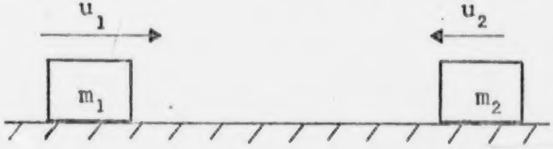
Two of these statements are true. These are

☐ ☐ %

and

☐ ☐ %

8. Two masses, $m_1 = 2$ slug and $m_2 = 4$ slug, move toward each other on a frictionless table with respective speeds of 4 ft/s and 2 ft/s. They collide and after the collision $m_1$ moves directly to the left with a speed of 3 ft/s. $m_2$ moves toward right and has a speed of



☐ ft/s ☐ %

Name ______________________________ VOLUME D PRE-TEST

9. A 1000-kg car traveling due east with a speed of 30 m/s collides with a 2000-kg truck traveling due north with a speed of 20 m/s. The two vehicles lock together. The magnitude of the momentum of the two-vehicle body immediately after the collision is

☐ kg-m/s ☐ %

Physics S211 | Date 4 October 1969
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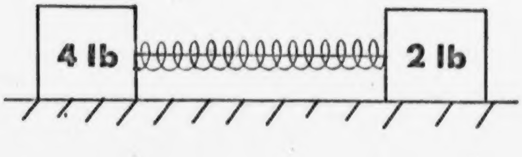
Section ______

# VOLUME D POST-TEST

1. A 4-kg body is moving toward the positive x-direction with a speed of 3 m/s. What is the magnitude of the body's momentum? (Include units.)



2. Two blocks weighing 4 lb and 2 lb, respectively, rest on a frictionless horizontal table. A compressed spring is placed between the two blocks but is not attached to either of the blocks. A string tied to the blocks keeps them from flying apart. Suddenly the string breaks and the 4-lb block is observed to move to the left with a speed of 2 ft/s. The 2-lb block is moving to the right with a speed of

Physics S211 Date 4 October 1969

Divisions 8&12 VOLUME D POST-TEST

3. The general mathematical form of Newton's second law of motion is

$$\vec{F}_{ext} = \frac{d\vec{p}}{dt} . \qquad (1)$$

For a body of constant mass (dm/dt = 0) this equation reduces to the familiar form

$$\vec{F}_{ext} = m\vec{a} \equiv m\, d\vec{v}/dt . \qquad (2)$$

In the case that both the velocity and the mass of a body are varying (dm/dt ≠ 0), an additional term must be added to the right-hand-side of equation (2). This term is

4. A 3-kg body is moving toward the positive x-direction with a speed of 2 m/s. An impulsive force applied to this body causes it to change its velocity to 5 m/s toward the positive x-direction. The magnitude of the impulse imparted to the body is (include units)

5. An impulsive force of constant direction and with average magnitude of 500 lb is applied to a body for a duration of 400 ms (1 ms = $10^{-3}$ s). What is the magnitude of the impulse imparted to the body during this time interval?

Physics S211

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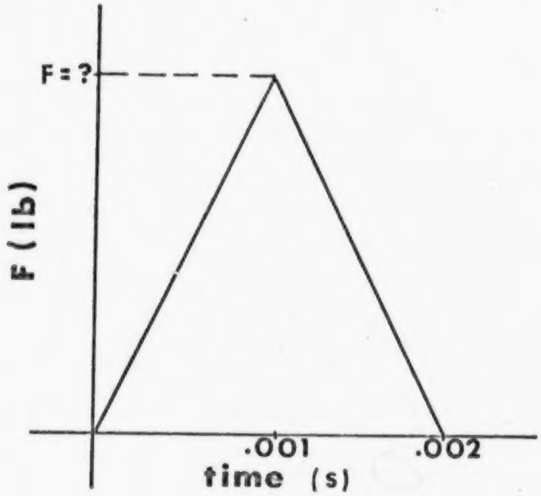
VOLUME D POST-TEST

6. The diagram shows the dependence of the force applied by a mallet to a croquet ball during the time of contact. If the magnitude of the total impulse imparted to the croquet ball by the mallet is 0.4 lb-s, what is the maximum value of the magnitude of this impulsive force?



7. Consider the following statements:

A. In each and every collision momentum is conserved.

B. Momentum is conserved only if the collision is perfectly elastic.

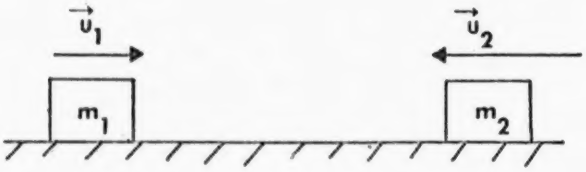
C. In a perfectly elastic collision both momentum and kinetic energy are conserved.

D. In a perfectly inelastic collision momentum is conserved but kinetic energy is not.

E. Whereas conservation of momentum holds true for perfectly elastic collisions, conservation of kinetic energy for such collisions depends on the shape of the colliding bodies.

Two of these statements are not true. These are

8. Two masses, $m_1 = 4$ slug and $m_2 = 2$ slug, move toward each other on a frictionless table with respective speeds of 4 ft/s and 8 ft/s. They collide and after the collision $m_1$ moves directly to the left with a speed of 3 ft/s. $m_2$ moves toward right and has a speed of



9. A 1000-kg car traveling due east with a speed of 30 m/s collides with a 2000-kg truck traveling due north with a speed of 20 m/s. The two vehicles lock together. The direction of the momentum of the two-vehicle body immediately after the collision is

Physics S211

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### ANSWER SHEET
### FOR
### VOLUME D POST-TEST

Name

______________________

ID No. ______________

Section No. ________

Group Letter ________

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | | | | | | | % |
| 2. | | | ft/s | | | | % |
| 3. | | | | | | | % |
| 4. | | | | | | | % |
| 5. | | | lb-s | | | | % |
| 6. | | | lb | | | | % |
| 7. | 7a | | | | | | % |
| | 7b | | | | | | % |
| 8. | | | ft/s | | | | % |
| 9. | | | degrees | | of | | % |

Physics S211 Date October 4, 1969

Name ______________________ Section Number _____

## VOLUME E PRE-TEST

1. If T is the period of revolution of a planet around the sun and a is the planet's mean distance from the sun, Kepler's third law (the law of the periods) states that

2. Experiments performed on the surface of the earth give a value for the universal gravitational constant

$$G = 6.67 \times 10^{-11}\ \text{N-m}^2/\text{kg}^2\ .$$

The mass of the moon is $1.23 \times 10^{-2}$ that of the earth and its radius is 0.27 times the earth's radius. If an astronaut performed the same experiments on the surface of the moon, what value would he find for G?

## VOLUME E PRE-TEST

3. Use Newton's law of universal gravitation,

$$F = G\frac{mM}{R^2}, \qquad (1)$$

and Newton's second law of motion to derive an expression for the magnitude of the acceleration due to gravity, g, on the surface of the earth. (In (1) let M be the mass of the earth, m the mass of a body on the earth's surface and R the earth's radius. Furthermore, assume the earth to be a perfect sphere of uniform mass distribution and neglect the earth's rotation.)

4. Determine the value of "g" at a distance of 4000 mi from the surface of the earth. (Take the earth's radius to be equal to 4000 mi, and the value of g at the earth's surface equal to 32 ft/s$^2$.)

5. From the following expressions select the one in which "m" stands for gravitational mass (as opposed to inertial mass).

| | | |
|---|---|---|
| A. | Weight of a body: | $w \simeq GmM/R^2$ |
| B. | Centripetal force: | $F = mv^2/r$ |
| C. | Gravitational potential energy: | $U = mgh$ |
| D. | Kinetic energy: | $K = (1/2)\, mv^2$ |

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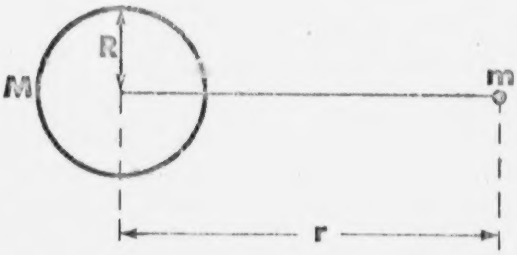
## VOLUME E PRE-TEST

6. A particle of mass m is located a distance r from the center of a spherical shell of radius R (r > R) and total mass M . The shell has uniform thickness and uniform mass density. Write down an expression for the magnitude of the force exerted on m by the shell.



7. A satellite is in circular orbit around the earth. Write down an expression giving the speed of the satellite in terms of the earth's mass, M, the radius of the satellite's orbit, r, and the constant of universal gravitation, G.

8. A sphere with uniform mass density has a radius equal to 2.58 m, and a mass of $10^5$ kg. Calculate the magnitude of the gravitational field strength at the surface of this sphere. (Neglect the effect of all other masses in the universe, take $G = 6.67 \times 10^{-11}$ N-m$^2$/kg$^2$ and include units.)

Physics S211 Date October 4, 1969

## VOLUME E PRE-TEST

9. Two particles have masses $m_1 = 1$ kg and $m_2 = 2$ kg, respectively, and are separated by a distance of 3 m. Locate the point on the line joining the two particles at which the potential of particle #1 is equal to that of particle #2.

10. Calculate the potential energy of the two particle configuration of the preceding problem. ($G = 6.67 \times 10^{-11}$ N-m$^2$/kg$^2$.)

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# ANSWER SHEET
# FOR
# VOLUME E PRE-TEST

Name ____________________

ID No. ____________

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1. ☐ is proportional to ☐ ☐ %

2. $G =$ ☐ $N\text{-}m^2/kg^2$ ☐ %

3. $g =$ ☐ ☐ %

4. ☐ $ft/s^2$ ☐ %

5. ☐ ☐ %

6. $F =$ ☐ ☐ %

7. $v =$ ☐ ☐ %

8. $\gamma =$ ☐ ☐ %

9. ☐ m from particle # ☐ ☐ %

10. $U =$ ☐ J ☐ %

Physics S211

Divisions 8&12

Date 11 October 1969

Name ______________

Section ________

## VOLUME E POST-TEST

1. Of the following statements select the one which does not represent one of Kepler's three laws of planetary motion.

   A. A line joining any planet to the sun sweeps out equal areas in equal times.

   B. The square of the period of any planet about the sun is proportional to the cube of the planet's mean distance from the sun.

   C. All planets move in elliptical orbits having the sun as one focus.

   D. The force of attraction between the sun and each planet is along the line joining the two and has magnitude which is proportional to the product of their masses and inversely proportional to the square of the distance between them.

2. Experiments performed on the surface of the earth give a value for the universal gravitational constant

$$G = 3.44 \times 10^{-8}\ \text{lb-ft}^2/\text{slug}^2.$$

The mass of the moon is $1.23 \times 10^{-2}$ that of the earth and its radius is 0.27 times the earth's radius. If an astronaut performed the same experiments on the surface of the moon, what value would he find for G?

Physics S211 Date 11 October 1969

Divisions 8&12 VOLUME E POST-TEST

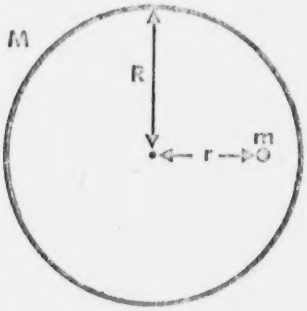
3. Two identical uniform spheres each of radius r and mass m are resting on a horizontal table. If the spheres are in contact, write down an expression for the magnitude of the gravitational force exerted by one of the spheres to the other.

4. Determine the weight of a 2-slug body at a distance of 4000 mi from the surface of the earth. (Take the earth's radius to be equal to 4000 mi, and the value of g at the earth's surface equal to 32 $ft/s^2$.)

5. From the following expressions select the one in which "m" (or "M") stands for inertial mass (as opposed to gravitational mass).

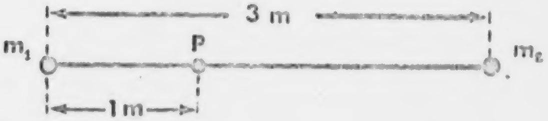
| | | |
|---|---|---|
| A. | weight of a body | $w = GmM/R^2$ |
| B. | escape velocity | $v_o = \sqrt{2GM/R}$ |
| C. | centripetal force | $F' = mv^2/R$ |
| D. | centripetal acceleration of a satellite | $a = GM/r^2$ |

6. A particle of mass m is located inside a spherical shell of radius R and mass M. The distance of m from the shell's center is r ($r < R$). If the shell has uniform thickness and uniform mass density, write down an expression for the magnitude of the force exerted by the shell on the particle.



7. A satellite is in circular orbit around the earth. Write down an expression giving the radius of the satellite's orbit in terms of the earth's mass, M, the satellite's speed, v, and the constant of universal gravitation, G.

8. Two particles of masses $m_1 = 1$ kg and $m_2 = 4$ kg, respectively, are separated by a distance of 3 m. Neglecting the effect of all other masses in the universe, compute the magnitude of the gravitational field strength at a point (P) located on the line joining the two particles and at a distance of 1 m from $m_1$. ($G = 6.67 \times 10^{-11}$ N-m$^2$/kg$^2$.)



Physics S211 Date 11 October 1969

Divisions 8&12 VOLUME E POST-TEST

9. For the two particles in problem 8 calculate the gravitational potential at point P. (Again neglect the effect of all other masses in the universe.)

10. Calculate the work that must be done against gravity in order to assemble the two-particle configuration of problem 8 starting with the two particles at an infinite separation. (Assume the effect of all other bodies in the universe to be negligible.)

Physics S211 Divisions 8&12 Date October 11, 1969

Name ____________________

Section No. ________

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## VOLUME E POST-TEST

| | Answers | | Confidence | Difficulty Rating |
|---|---|---|---|---|
| 1. | | | % | |
| 2. | G = | lb-ft$^2$/slug$^2$ | % | |
| 3. | F = | | % | |
| 4. | | lb | % | |
| 5. | | | % | |
| 6. | F = | | % | |
| 7. | r = | | % | |
| 8. | $\gamma(P)$ = | N/kg | % | |
| 9. | V(P) = | J/kg | % | |
| 10. | W = | J | % | |

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Physics S211 Date 11 October 1969

## VOLUME F PRE-TEST

1. Two point charges are separated by a distance of one meter. The value of each charge is +1 coulomb. What is the magnitude of the force exerted by one charge on the other charge?

2. Consider the two charges discussed above. Will they attract or repel each other?

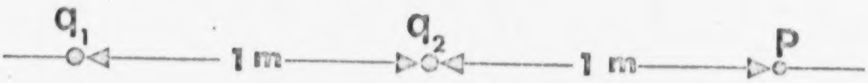
3. The charge developed on an insulated glass rod rubbed with a silk cloth is designated:

4. A heated cathode loses electrons at the rate of 10 electrons/minute. After 10 minutes, what is the charge on the cathode ($q_e = 1.6 \times 10^{-19}$ coulombs)?

Name ______________________ VOLUME F PRE-TEST

5. A charge q = −1C is exposed to an electric field $\vec{E} = 10\hat{i}$. What is the magnitude and direction of the force on the charge q? (Include units.)

6. Two point charges $q_1$ and $q_2$ are one meter apart. If $q_1 = -4C$ and $q_2 = +1C$, what is the magnitude and direction of the electric field at point P shown below?

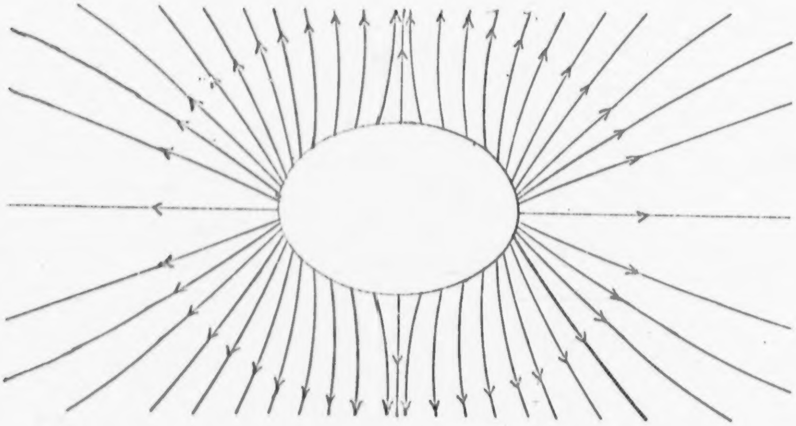


7. A rubber rod is rubbed with fur and brought near the knob of the electroscope. If the leaves of the electroscope move apart due to the proximity of the rod, what is the sign of the charge on the leaves.

Name ______________________ VOLUME F PRE-TEST

8. A portion of an electric field line diagram (see below) has been erased. Of the four choices given below, which is most likely responsible for the illustrated field?

   A. two positive charges
   B. two negative charges
   C. a single positive charge
   D. a single negative charge



Name ____________________ VOLUME F PRE-TEST

9. Assume that the leaves of an electroscope are positively charged. A negatively charged rubber rod is brought near the knob and at the same time the knob is touched by a grounded conductor. Next, the conductor is removed, the rubber rod is removed (in that order), and the leaves are observed to return to their original position. What is the charge on the leaves of the electroscope?

10. A charge $q = 1\ \mu C$ resides on a very small object of mass $m = 1\ \mu C$. The charged object is placed in an electric field produced by an infinitely long wire that is uniformily charged ($\lambda = 1$ C/m). The small object is 4 meters from the wire. What is the magnitude of the electric field 4 meters from the wire? (Include units).

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Date October 11, 1969

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Section No. ________

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Group Letter ________

## VOLUME F PRE-TEST

| | Answers | | Confidence | | Difficulty Rating |
|---|---|---|---|---|---|
| 1. | | N | | % | |
| 2. | | | | % | |
| 3. | | | | % | |
| 4. | | C | | % | |
| 5. | | | | % | |
| 6. | | N/C | | % | |
| 7. | | | | % | |
| 8. | | | | % | |
| 9. | | | | % | |
| 10. | | N/C | | % | |

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## VOLUME F POST-TEST

1. Two point charges are separated by a distance of one meter. The value of each charge is +1 coulomb. What is the magnitude of the force exerted by one charge on the other charge?

2. A charge $q = +10$ coulombs is located in an electric field. The force on the charge is measured to be $20\hat{i}$ newtons. What is the magnitude of the electric field at the point where the charge is located? (Include units.)

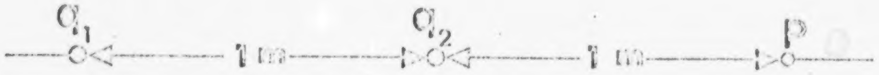
3. The charge developed on an insulated glass rod rubbed with a silk cloth is designated:

4. A heated cathode loses electrons at the rate of 10 electrons/minute. If the cathode is initially uncharged, what will be the total charge on the cathode after 10 minutes? (The charge on each electron is $q_e = 1.6 \times 10^{-19}$ C.)

Name ______________________

5. A charge $q = -1C$ is exposed to an electric field $\vec{E} = 10\hat{i}$. What is the magnitude and direction of the force on the charge $q$? (Include units.)

6. Two point charges $q_1$ and $q_2$ are one meter apart. If $q_1 = -4C$ and $q_2 = +1C$, what is the magnitude and direction of the electric field at point P shown below?



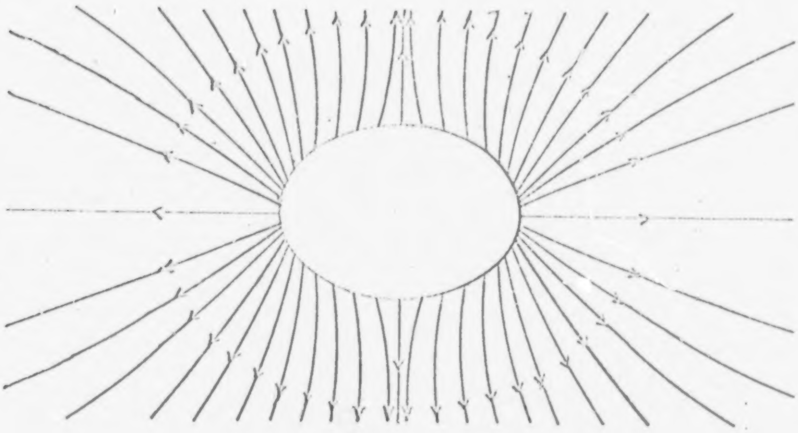
7. A negatively charged rubber rod is rubbed with fur and brought near the knob of an uncharged electroscope. If the leaves of the electroscope move apart due to the proximity of the rod, what is the sign of the charge on the leaves.

Name ______________________

VOLUME F POST-TEST

8. A portion of an electric field line diagram (see below) has been erased. Of the four choices given below, which is most likely responsible for the illustrated field?

   A. two positive charges
   B. two negative charges
   C. a single positive charge
   D. a single negative charge



Name ______________________ VOLUME F POST-TEST

9. Assume that the leaves of an electroscope are positively charged. A negatively charged rubber rod is brought near the knob of an electroscope and at the same time the knob is touched by a grounded conductor. Next, the conductor is removed, the rubber rod is removed (in that order), and the leaves are observed to return to their original position. What is the charge on the leaves of the electroscope?

10. A charge $q = 1\ \mu C$ resides on a very small object of mass $m = 1\ \mu g$. The charged object is placed in an electric field produced by an infinitely long wire that is uniformily charged ($\lambda = 1\ C/m$). The small object is 4 meters from the wire. What is the magnitude of the force on the small charged object?

Physics S211 Date 18 October 1969

Name ______________ Section No. ________

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## VOLUME F POST-TEST

|  | Answers |  | Confidence |  | Difficulty Rating |
|---|---|---|---|---|---|
| 1. |  | N |  | % |  |
| 2. |  | N/C |  | % |  |
| 3. |  |  |  | % |  |
| 4. |  | C |  | % |  |
| 5. |  |  |  | % |  |
| 6. |  |  |  | % |  |
| 7. |  |  |  | % |  |
| 8. |  |  |  | % |  |
| 9. |  |  |  | % |  |
| 10. |  | N |  | % |  |

Name ______________________________ Section Number __________

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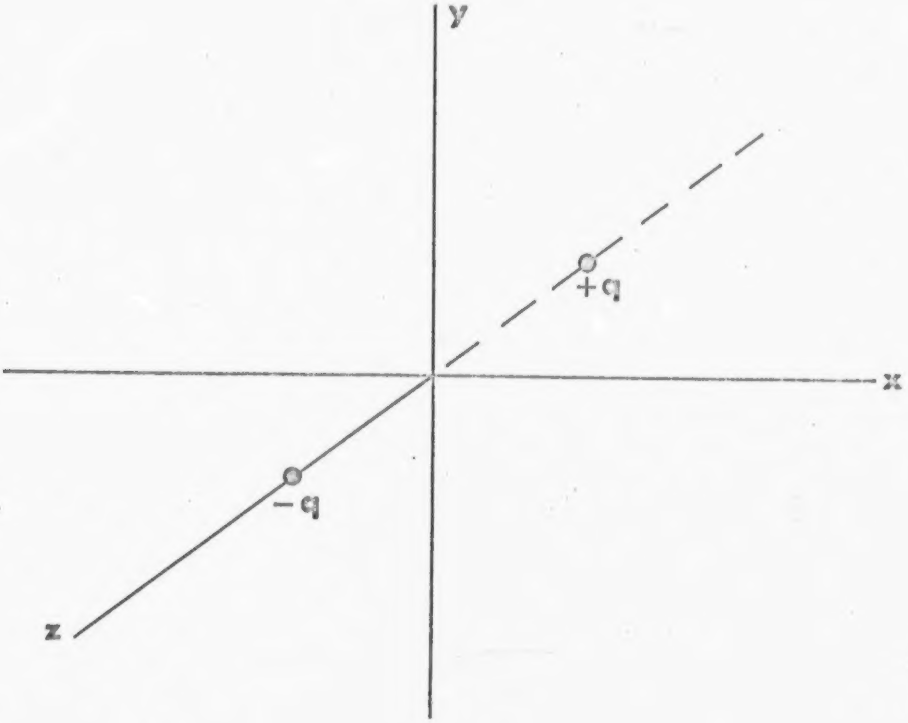
Physics S211 Date 18 October 1969

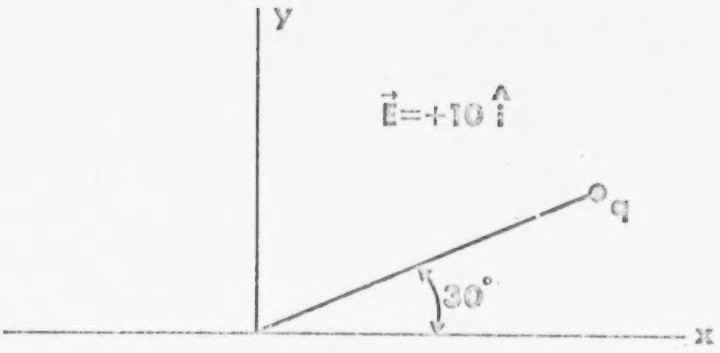
## VOLUME G PRE-TEST

1. The diagram below shows a charge configuration called an electric dipole. The charges are separated by a distance of $10^{-4}$ m. If the charges, $q = 10^{-7}$ C, are exposed to an electric field $\vec{E} = -10\ \hat{i}$, what is the net force on the dipole?



Name ______________________________ VOLUME G PRE-TEST

2.

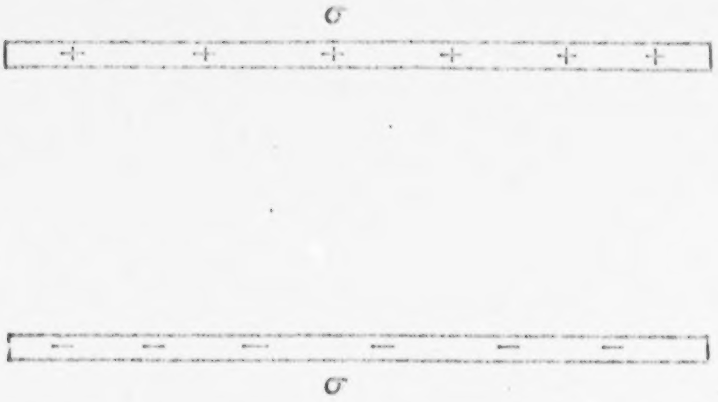


A charge q = +10 C is suspended from the end of an insulated rod of length r = 1 m. Calculate the torque about the origin due to the force on the charge. The uniform electric field is shown in the diagram.

3. Suppose the dipole shown in the diagram of question one is exposed to an electric field $\vec{E} = 10\,\hat{j}$. What is the magnitude of the net torque on the dipole?

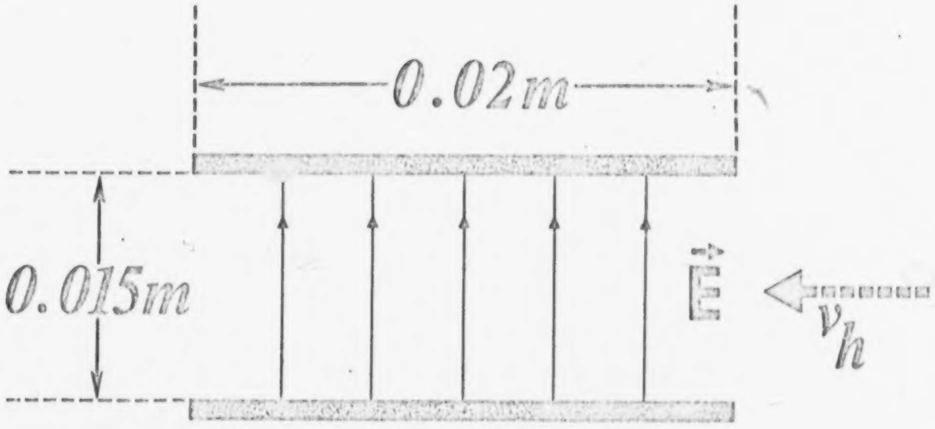
4. Suppose the dipole shown in the diagram of question one is exposed to an electric field $\vec{E} = 10\,\hat{i}$. What is the value of the potential energy of the dipole in that position?

5.



Two large, parallel plates are oppositely charged. The electric field produced by each plate can be described by $E = \sigma/2\varepsilon_0$. If in the above diagram, the field produced by each plate is $E = 10$ N/C, what is the net field between the two plates?

6.



An electron enters the space between two parallel plates with a horizontal velocity $v_h = 100$ km/s (see diagram above). If the net electric field between the plates is $|E| = 10^{-1}$ N/C, what will be the horizontal velocity of the electron as it leaves the space between the plates on the left side? (The charge on an electron is $q_e = -1.6 \times 10^{-19}$ C.)

Name ______________________ VOLUME C PRE-TEST

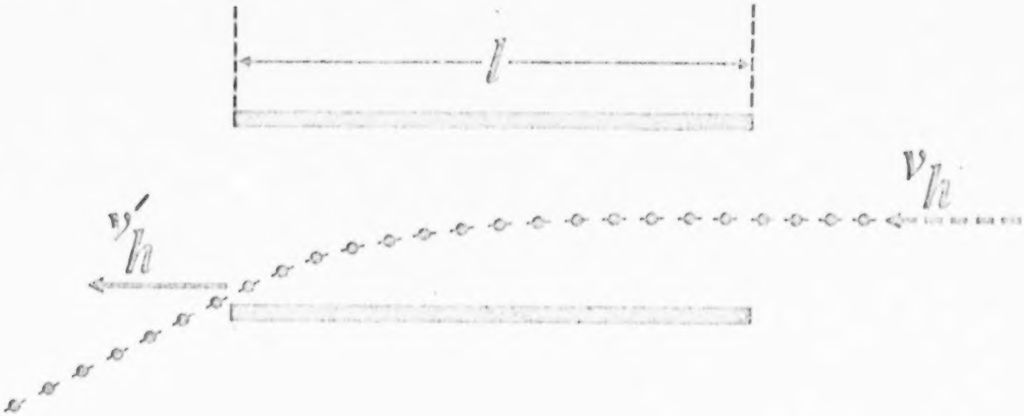
7. Calculate the work done in moving a charge q = 1 C at constant speed through a displacement $\vec{r} = 10\ \hat{i}$ in a field $\vec{E} = -10\ \hat{i}$.

8. An electric field is observed to increase as follows: $\vec{E} = -10\ x\ \hat{i}$. Calculate the work done in moving a charge q = 1 C from x = 1 m to x = 3 m.

9. Suppose the dipole shown in the diagram of question one is exposed to an electric field $\vec{E} = 10\ \hat{i} - 20\ \hat{k}$. What is the direction of the net torque on the dipole?

Name ______________________ VOLUME G PRE-TEST

10.



The above diagram shows the trajectory of an electron before, during, and after entering the space between two parallel plates. Suppose we know that $\ell = 0.05$ m, and that the plates are 0.004 m apart. If the electron enters with a horizontal velocity of $4 \times 10^7$ m/s, what must be the value of the electric field so that the electron just misses the edge of the bottom plate? (Include magnitude and direction.)

Physics S211

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## VOLUME G PRE-TEST

| | Answers | Confidence | Difficulty Rating |
|---|---|---|---|
| 1. | ☐ N | ☐ % | ☐ |
| 2. | ☐ N-m | ☐ % | ☐ |
| 3. | ☐ N-m | ☐ % | ☐ |
| 4. | ☐ J | ☐ % | ☐ |
| 5. | ☐ N/C | ☐ % | ☐ |
| 6. | ☐ km/s | ☐ % | ☐ |
| 7. | ☐ J | ☐ % | ☐ |
| 8. | ☐ J | ☐ % | ☐ |
| 9. | ☐ | ☐ % | ☐ |
| 10. | ☐ N/C | ☐ % | ☐ |

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Student ID Number __________ Group Letter __________

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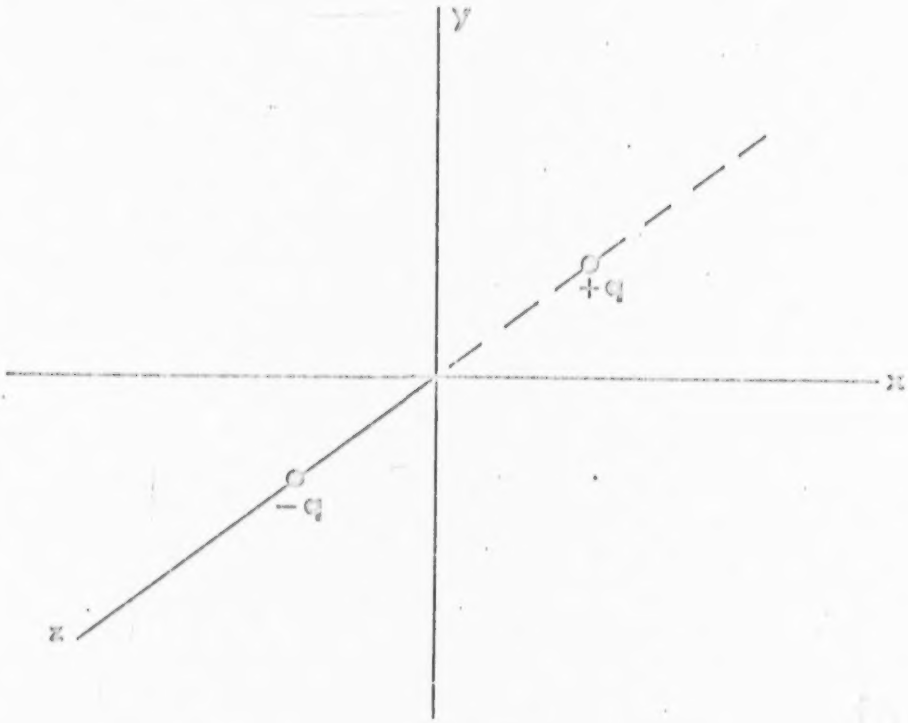
Physics S211 Date 25 October 1969

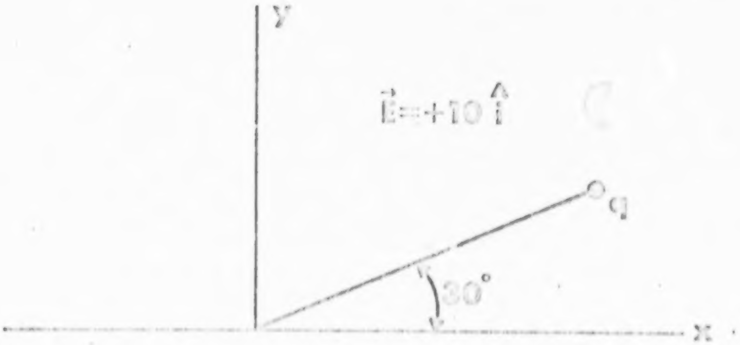
## VOLUME G POST-TEST

1. The diagram below shows a charge configuration called an electric dipole. The charges are separated by a distance of $10^{-4}$ m. If the charges, $q = 10^{-7}$ C, are exposed to an electric field $\vec{E} = -10\,\hat{i}$, what is the net force on the dipole?



Name ______________________________ VOLUME G POST TEST

2.

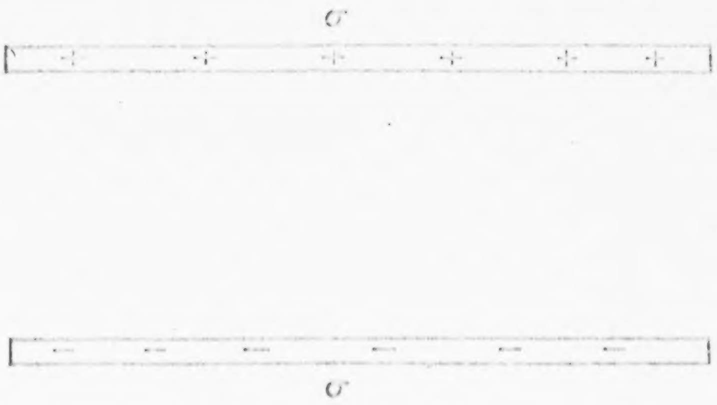


A charge $q = +10$ C is suspended from the end of an insulated rod of length $r = 1$ m. Calculate the torque about the origin due to the force on the charge. The uniform electric field is shown in the diagram.

3. Suppose the dipole shown in the diagram of question one is exposed to an electric field $\vec{E} = 10\ \hat{j}$. What is the magnitude of the net torque on the dipole?

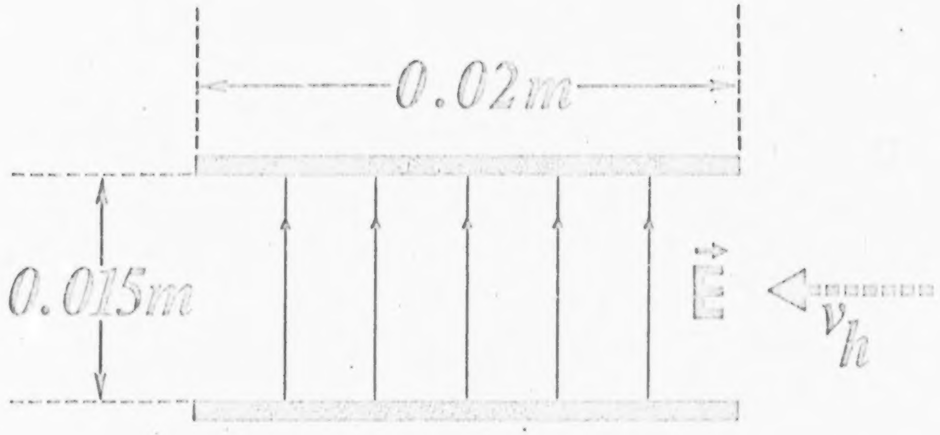
4. Suppose the dipole shown in the diagram of question one is exposed to an electric field $\vec{E} = 10\ \hat{i}$. What is the value of the potential energy of the dipole in that position?

5.



Two large, parallel plates are oppositely charged. The electric field produced by each plate can be described by $E = \sigma/2\varepsilon_o$. If in the above diagram, the field produced by each plate is $E = 10$ N/C, what is the net field between the two plates?

6.



An electron enters the space between two parallel plates with a horizontal velocity $v_h = 100$ km/s (see diagram above). If the net electric field between the plates is $|E| = 10^{-1}$ N/C, what will be the horizontal velocity of the electron as it leaves the space between the plates on the left side? (The charge on an electron is $q_e = -1.6 \times 10^{-19}$ C.)

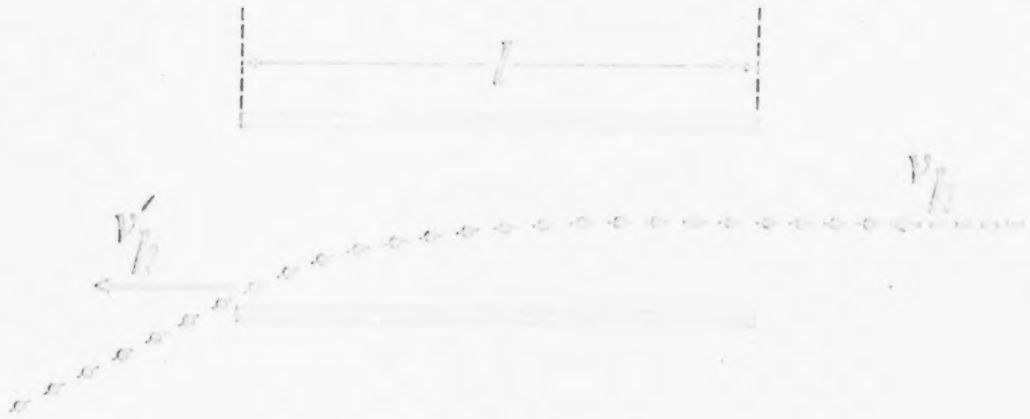
Name ______________________

7. Calculate the work done by an outside agent in moving a charge $q = 1$ C at constant speed through a displacement $\vec{s} = 10\ \hat{i}$ in a field $\vec{E} = -10\ \hat{i}$.

8. An electric field is changing with position as follows: $\vec{E} = -10x\ \hat{i}$. Calculate the work done by an outside agent in moving a charge $q = 1$ C from $x = 1$ m to $x = 3$ m.

9. Suppose the dipole shown in the diagram of question one is exposed to an electric field $\vec{E} = 10\ \hat{i} - 20\ \hat{k}$. What is the direction of the net torque on the dipole?

10.



The above diagram shows the trajectory of an electron before, during, and after entering the space midway between two parallel plates. Suppose we know that $\ell = 0.05$ m, and that the plates are 0.004 m apart. If the electron enters with a horizontal velocity of $4 \times 10^7$ m/s, what must be the value of the electric field so that the electron just misses the edge of the bottom plate? (Include magnitude and direction.)

Physics 5211

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## VOLUME G POST-TEST

| | Answer | | Confidence | | Difficulty Rating |
|---|---|---|---|---|---|
| 1. | | N | | % | |
| 2. | | N-m | | % | |
| 3. | | N-m | | % | |
| 4. | | J | | % | |
| 5. | | N/C | | % | |
| 6. | | km/s | | % | |
| 7. | | J | | % | |
| 8. | | J | | % | |
| 9. | | | | % | |
| 10. | | N/C | | % | |

Name________________________ Student Number______________

Student ID Number____________ Group Letter________________

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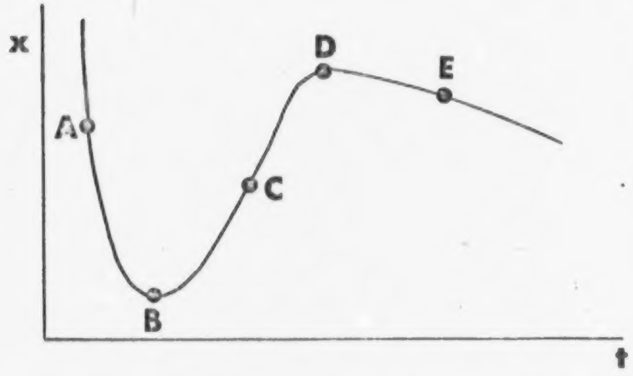
Physics S211 Date 1 November 1969

VOLUME H POST-TEST

1. A plane travels 40 miles due north. It then turns due west and travels for 30 miles. The total displacement of the plane is

2. The runway of an airport is 5000 ft long. A cargo plane starts from one end of the runway and develops a constant acceleration of 2 $ft/s^2$. Fifty seconds after the start the pilot notices some defect and immediately applies the brakes. Assuming instantaneous change of acceleration, what is the minimum (constant) acceleration that must be applied for the plane to stop on the runway?

3. In the figure the displacement of a particle is plotted as a function of time. Of the points labeled by alphabetic letters on the graph, select the one at which the magnitude of the velocity is a maximum.

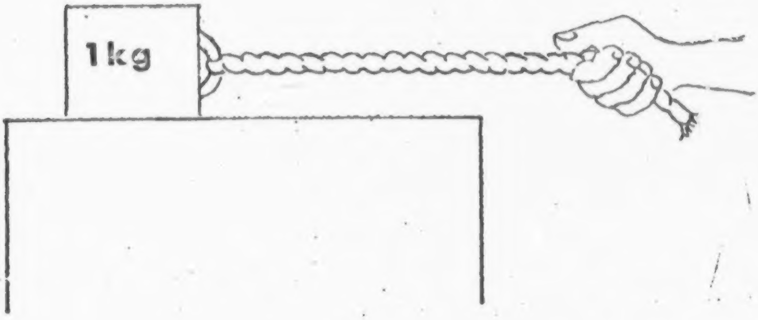


4. A force of 6 N applied to a block causes it to accelerate at 12 $m/s^2$. If the mass of the block is tripled and the same force is applied, what will be the acceleration of the block?

Name______________________________

VOLUME H POST-TEST

5.

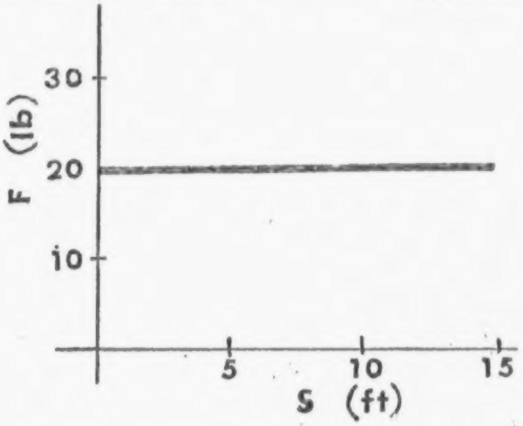


A 1.0 kg block rests on a horizontal surface. The block is tied to a rope and a horizontal force of magnitude 5.96 N is applied to the other end of the rope. The coefficient of kinetic friction $\mu_k = 0.2$. What is the acceleration of the block?

6. A section of level roadway has a radius of curvature of 200 m and is expected to handle traffic at 10 m/s. What minimum coefficient of friction prevents skids at this speed?

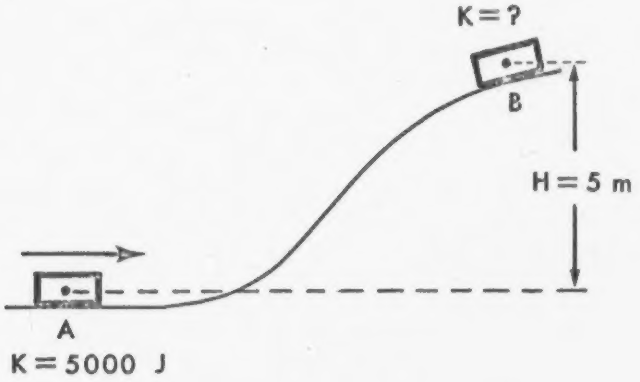
Name______________________________ VOLUME H POST-TEST

7. The diagram shows how a force applied to a 5-lb object varies with the displacement of the object. Calculate the work done by this force in moving the object from the origin to s = 20 ft.



8. A constant force of magnitude 200 lb is required to move a block along a horizontal floor with constant speed of 8 ft/s. The force is directed along the motion of the block. Calculate the power delivered by this force.

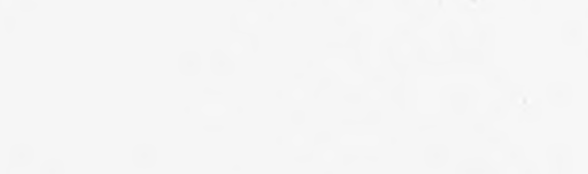
9. At point A a 100-kg roller coaster has a kinetic energy equal to 5000 J. What will be the kinetic energy of the coaster when it reaches point B? (neglect friction)



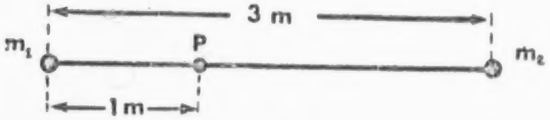
10. A 6-kg body is moving toward the positive x-direction with a speed of 8 m/s. What is the magnitude of the body's momentum? (Include units.)

11. A 3-kg body is moving toward the positive x-direction with a speed of 2 m/s. An impulsive force applied to this body causes it to change its velocity to 6 m/s toward the positive x-direction. The magnitude of the impulse imparted to the body is

12. Two masses, $m_1$ = 8 slug and $m_2$ = 2 slug, move toward each other on a frictionless table with respective speeds of 4 ft/s and 8 ft/s. They collide and after the collision $m_1$ moves directly to the left with a speed of 3 ft/s. $m_2$ moves toward right and has a speed of



13. Two identical uniform spheres each of radius r and mass m are resting on a horizontal table. If the spheres are in contact, write down an expression for the magnitude of the gravitational force exerted by one of the spheres on the other.



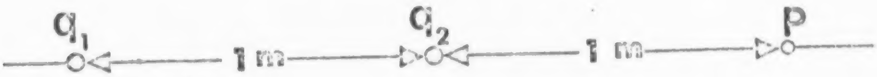
14. Two particles of masses $m_1$ = 1 kg and $m_2$ = 4 kg, respectively, are separated by a distance of 3 meters. Neglecting the effect of all other masses in the universe, compute the magnitude of the gravitational field strength at a point (P) located on the line joining the two particles and at a distance of 1 meter from $m_1$. (G = 6.67 × 10-11 N-m$^2$/kg$^2$.)

15. Calculate the work that must be done against gravity in order to assemble the two-particle configuration of problem 14 starting with the two particles at an infinite separation. (Assume the effect of all other bodies in the universe to be negligible.)

16. Two point charges are separated by a distance of three meters. The value of each charge is +1 coulomb. What is the magnitude of the force exerted by one charge on the other charge?

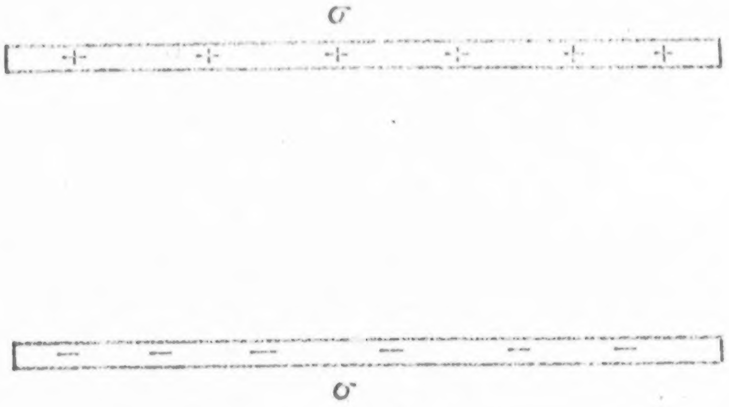
17. A charge $q = -1C$ is exposed to an electric field $\vec{E} = 20\hat{i}$. What is the magnitude and direction of the force on the charge $q$?

18. Two point charges $q_1$ and $q_2$ are one meter apart. If $q_1 = -4C$ and $q_2 = +4C$, what is the magnitude and direction of the electric field at point P shown below?



Name______________________________

19.



Two large, parallel plates are oppositely charged. The electric field produced by each plate can be described by $E = \sigma/2\varepsilon_0$. If in the above diagram, the field produced by each plate is $E = 20$ N/C, what is the net field between the two plates?

20. Calculate the work done by an outside agent in moving a charge $q = 1$ C at constant speed through a displacement $\vec{r} = -10\,\hat{i}$ in a field $\vec{E} = -20\,\hat{i}$.

Physics S211

Name ______________________

ID No. __________

Date 1 November 1969

Section No. ________

Group Letter ________

## VOLUME H POST-TEST

| | Answers | Confidence | Difficulty Rating |
|---|---|---|---|
| 1. | miles | % | |
| 2. | $ft/s^2$ | % | |
| 3. | | % | |
| 4. | $m/s^2$ | % | |
| 5. | $m/s^2$ | % | |
| 6. | | % | |
| 7. | ft. lb. | % | |
| 8. | ft-lb/s | % | |
| 9. | J | % | |
| 10. | | % | |

Physics S211

Name ____________________

ID No. ________

Date 1 November 1969

Section No. ________

Group Letter ________

## VOLUME H POST-TEST

| | Answers | Confidence | Difficulty Rating |
|---|---|---|---|
| 11. | kg-m/s | % | |
| 12. | ft/s | % | |
| 13. | | % | |
| 14. | γ(P)= N/kg | % | |
| 15. | W = J | % | |
| 16. | N | % | |
| 17. | N | % | |
| 18. | N/C | % | |
| 19. | N/C | % | |
| 20. | J | % | |

Name______________________ Section Number____

Student ID Number__________ Group Letter______

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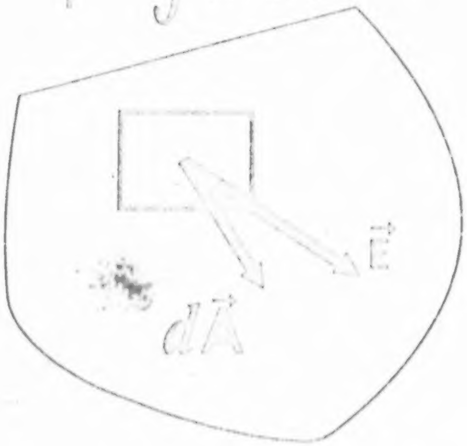
Physics S211 Date 25 October 1969

## VOLUME I PRE-TEST

$$\phi = \int \vec{E} \cdot d\vec{A}$$



1. In the diagram above, the symbol $\phi$ is defined and it is called:

2. Figure 1 on the next page shows an area of width W = 2m and length L = 4 m at an angle of $30^0$ with respect to the z-axis. An electric field $\vec{E}$ is parallel to the y-axis and has a magnitude of 10 N/C (see Figure 2 on the next page). What is the electric flux through the surface area LW?

3. A closed cube, one meter on edge, is placed in an electric field given by $\vec{E} = -9\,\hat{j}$. What is the electric flux through the surface of the cube?

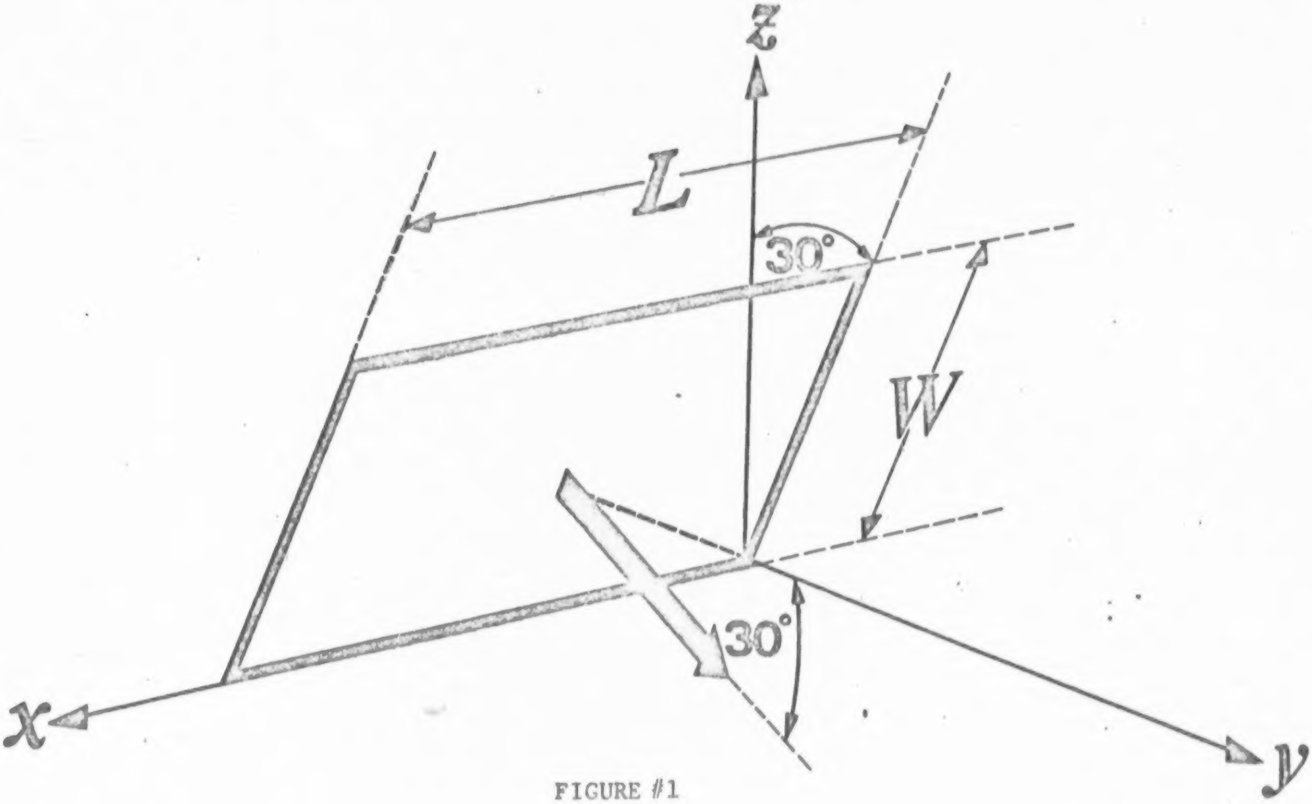


FIGURE #1

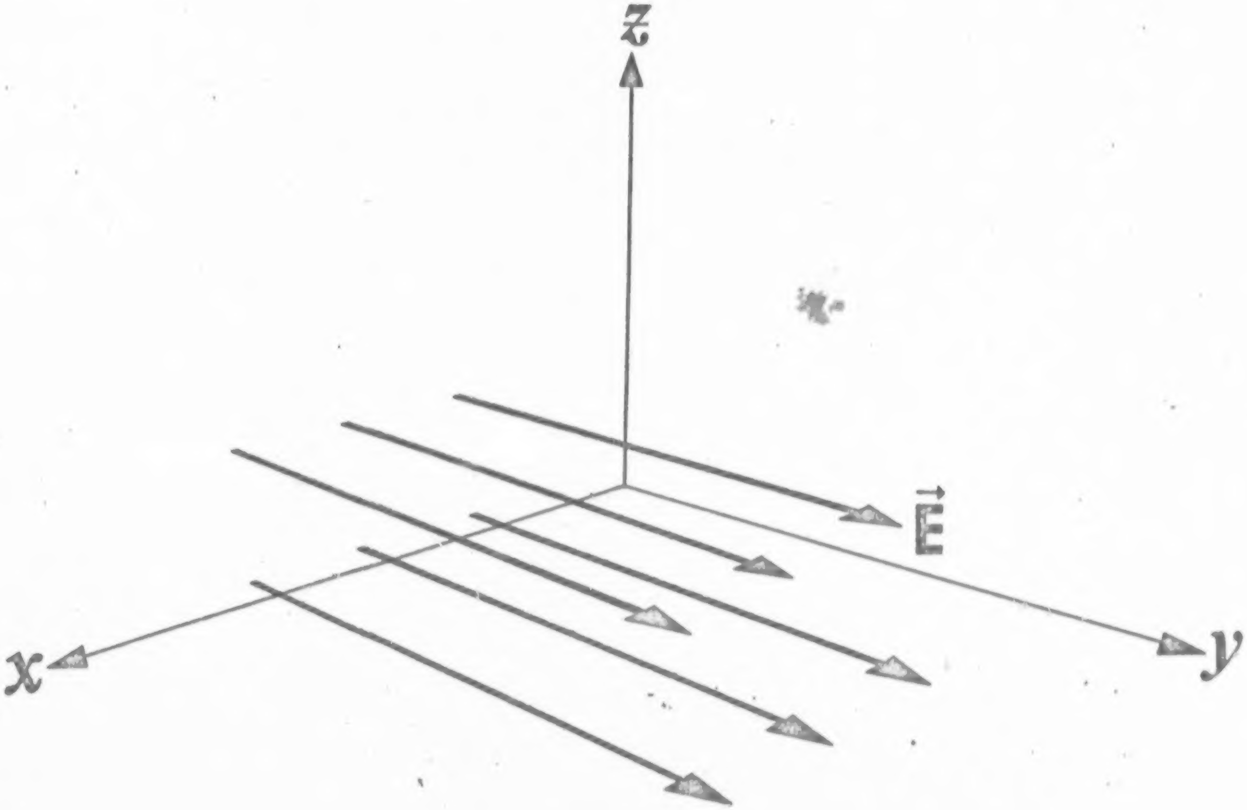
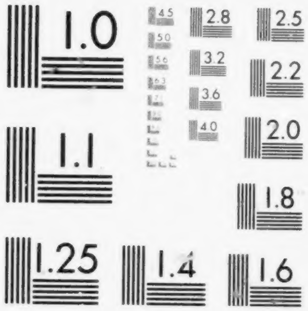


FIGURE #2

# 7 OF 7

# ED 075 258


1.0
4.5
5.0
5.6
6.3
2.8
3.2
3.6
4.0
2.5
2.2
2.0
1.1
1.8
1.25
1.4
1.6

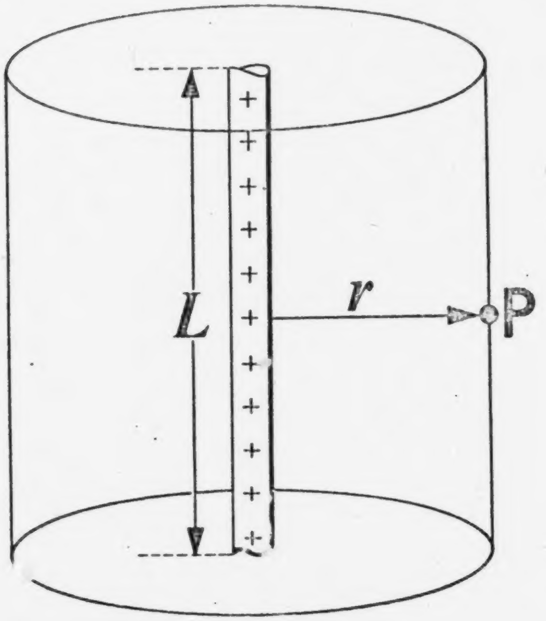
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Name____________________ VOLUME I PRE-TEST

CHARGE

DENSITY = λ

4. The figure on the left shows a portion of an infinitely long wire with a uniform charge λ = 1 C/m. Use Gauss's law to determine the electric field at point P which is a distance of 2 m from the wire.

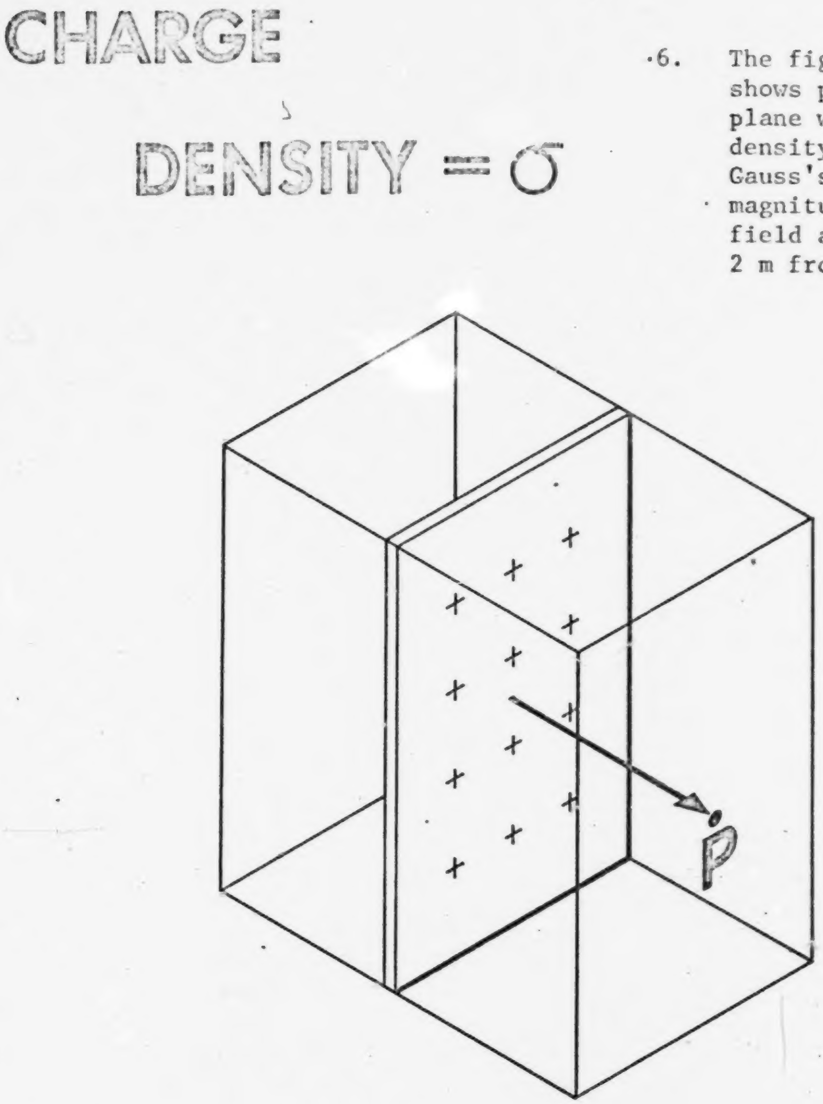


5. Which of the following can be considered a Gaussian surface? (There may be more than one).

A. Spherical shell
B. Open-ended cylinderical shell.
C. Six-sided cubical shell.
D. A hemispherical shell.

Name________________________ VOLUME I PRE-TEST

6. The figure on the left shows part of a very large plane with a uniform charge density $\sigma = 180\ C/m^2$. Use Gauss's law to determine the magnitude of the electric field at point P which is 2 m from the plane.

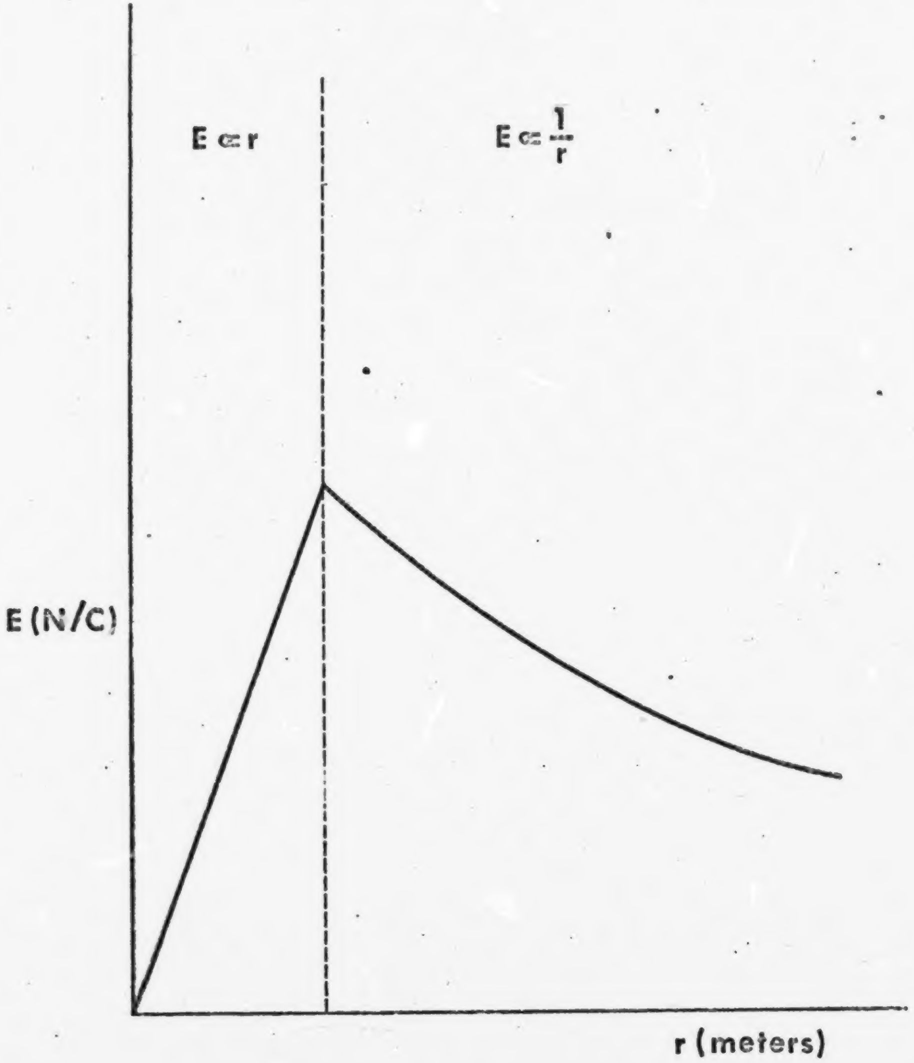


7. A non-conducting sphere ($\sigma = +3\ C/m^3$) has a radius of one meter. The sphere is plunged into a very cold liquid solution (temperature = $1^0$ K) and transforms into a conductor. What is the surface charge, $\sigma$ ($C/m^2$), of the sphere? (The volume of a sphere is $4/3\ \pi r^3$ and the area is $4\pi r^2$).

Name______________________________ VOLUME I PRE-TEST

8. The diagram below shows the magnitude of the electric field plotted as a function of distance. Which of the following objects could produce such an electric field?

A. A uniformly charged, non-conducting cylinder
B. A charged conducting sphere
C. A charged conducting cylinder
D. Either B or C



9. In the equation for Gauss's law

$$\oint \vec{E} \cdot dA = \frac{q}{\varepsilon_o} ,$$

the q term indicates:

A. The given charge enclosed by the Gaussian surface
B. The net charge enclosed by the Gaussian surface
C. The net charge enclosed by the Gaussian surface and any other charges in proximity to the Gaussian surface
D. The absolute value of the net charge enclosed by the Gaussian surface

10. A positive charge of .9 coulombs is placed at the origin of the coordinate system shown. A spherical surface, whose radius is 3.0 m, has its center at the origin. Find the total electric flux $\phi_E$ through the surface. (Use $\varepsilon_o \simeq 9 \times 10^{-12}$ $C^2/N\text{-}m^2$.)

Physics S211

Date 25 October 1969

Name ______________________

Section No. ________

ID No. ____________________

Group Letter ________

VOLUME I PRE-TEST

| | Answers | | Confidence | | Difficulty Rating |
|---|---|---|---|---|---|
| 1. | ☐ | | ☐ | % | ☐ |
| 2. | ☐ | N-m$^2$/C | ☐ | % | ☐ |
| 3. | ☐ | | ☐ | % | ☐ |
| 4. | ☐ | N/C | ☐ | % | ☐ |
| 5. | ☐ | | ☐ | % | ☐ |
| 6. | ☐ | N/C | ☐ | % | ☐ |
| 7. | ☐ | C/m$^2$ | ☐ | % | ☐ |
| 8. | ☐ | | ☐ | % | ☐ |
| 9. | ☐ | | ☐ | % | ☐ |
| 10. | ☐ | N-m$^2$/C | ☐ | % | ☐ |

Name____________________________ Section Number______

Student ID Number______________ Group Letter_______

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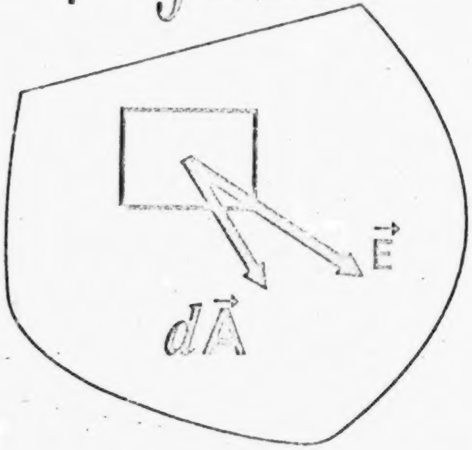
Physics S211 Date 8 November 1969

## VOLUME I POST TEST

$$\phi = \int \vec{E} \cdot d\vec{A}$$



1. In the diagram above, the symbol $\phi$ is defined and it is called:

2. Figure 1 on the next page shows an area of width $W = 2$ m and length $L = 4$ m at an angle of 30° with respect to the x-z plane. There is in this region an electric field $\vec{E}$ parallel to the y-axis with a magnitude of 10 N/C (see Figure 2 on the next page). What is the electric flux through the surface area LW?

3. A closed cube, one meter on edge, is placed in an electric field given by $\vec{E} = -9\,\hat{j}$. What is the net electric flux through the entire surface of the cube?

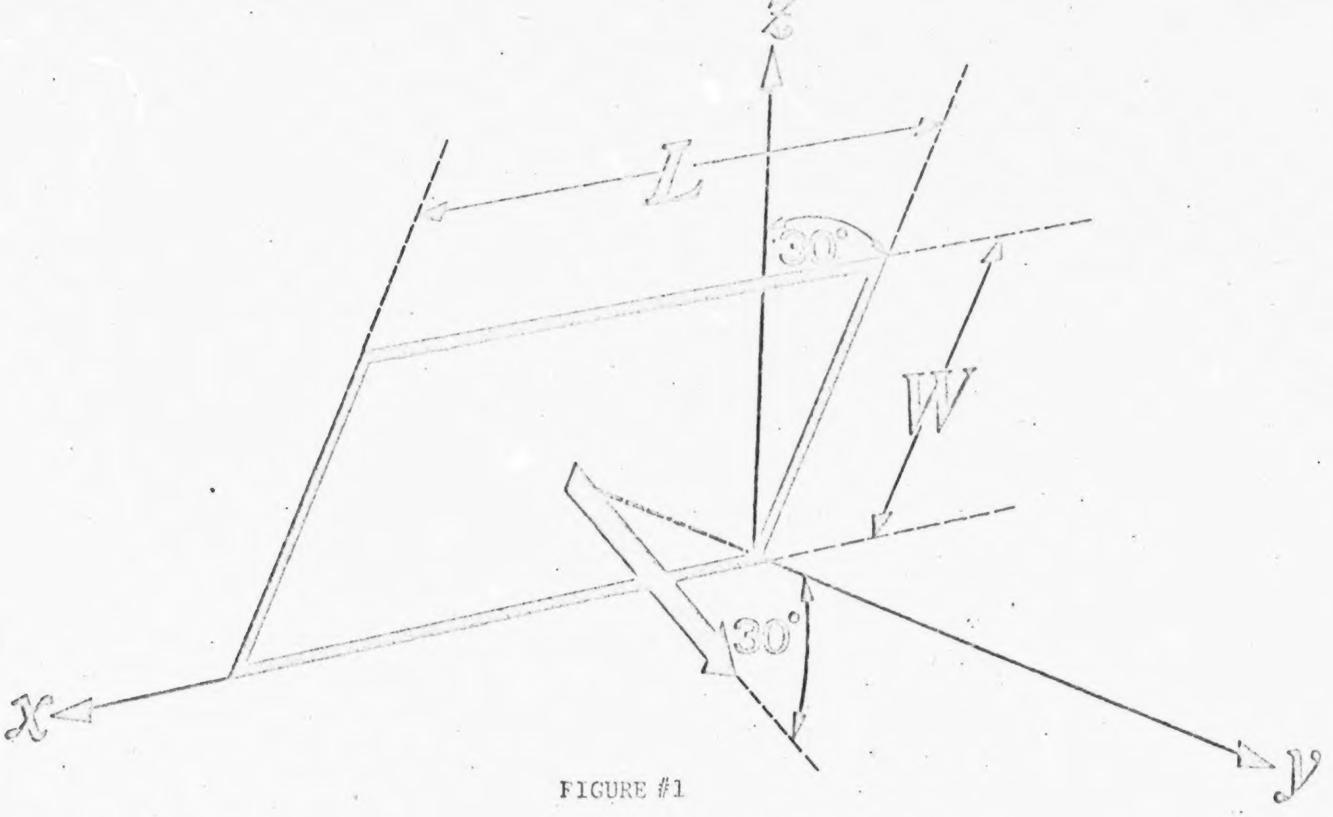


FIGURE #1

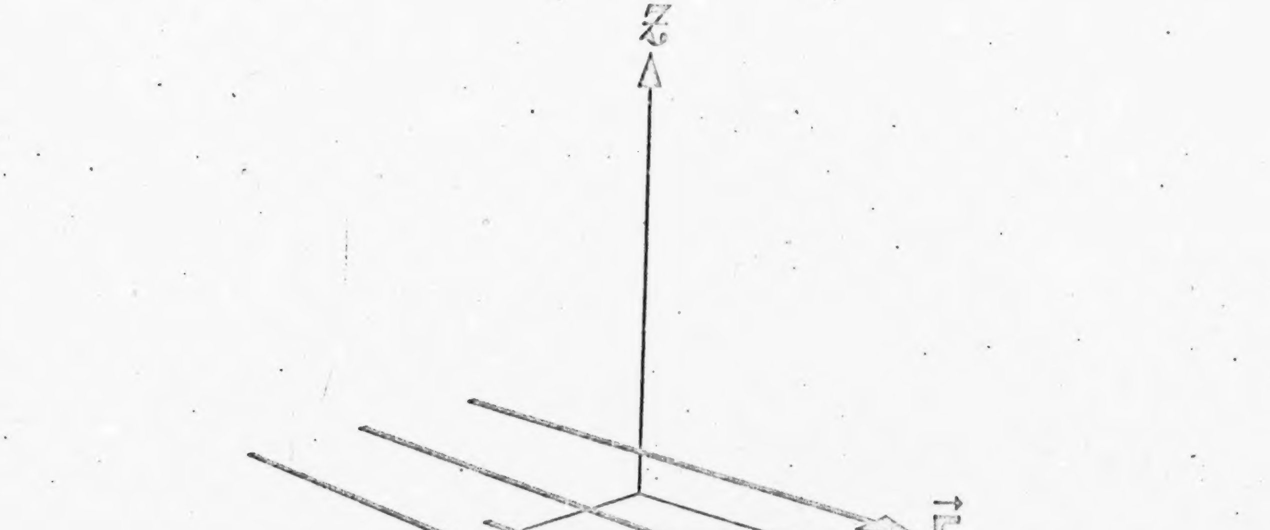
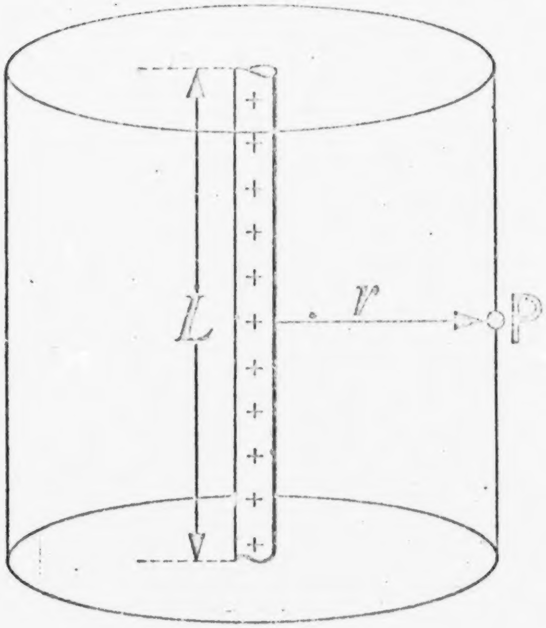


FIGURE #2

CHARGE

DENSITY = λ

4. The figure on the left shows a portion of an infinitely long wire with a uniform charge λ = 1 C/m. Use Gauss's law to determine the electric field at point P which is a distance of 2 m from the wire.

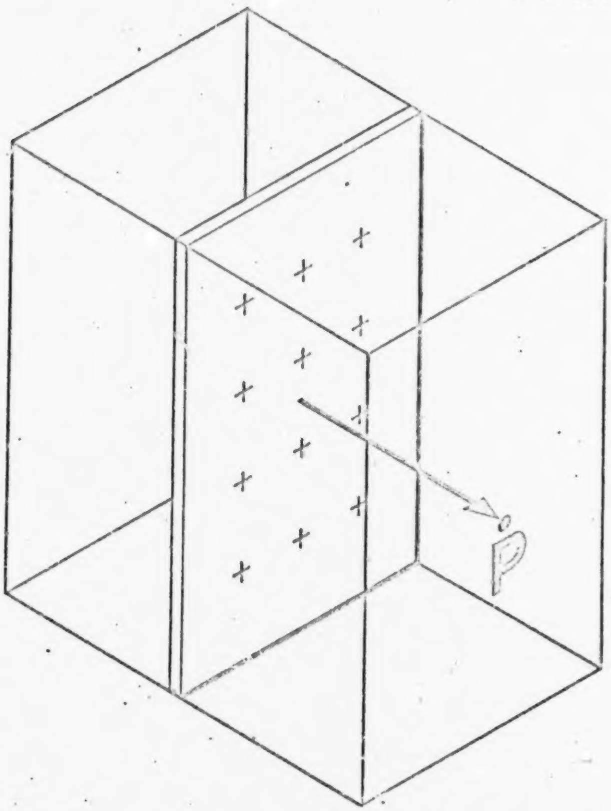


5. Which of the following can be considered a Gaussian surface? (There may be more than one).

A. Spherical shell.
B. Open-ended cylinderical shell.
C. Six-sided cubical shell.
D. A plane, 3m × 4m.

Name______________________________

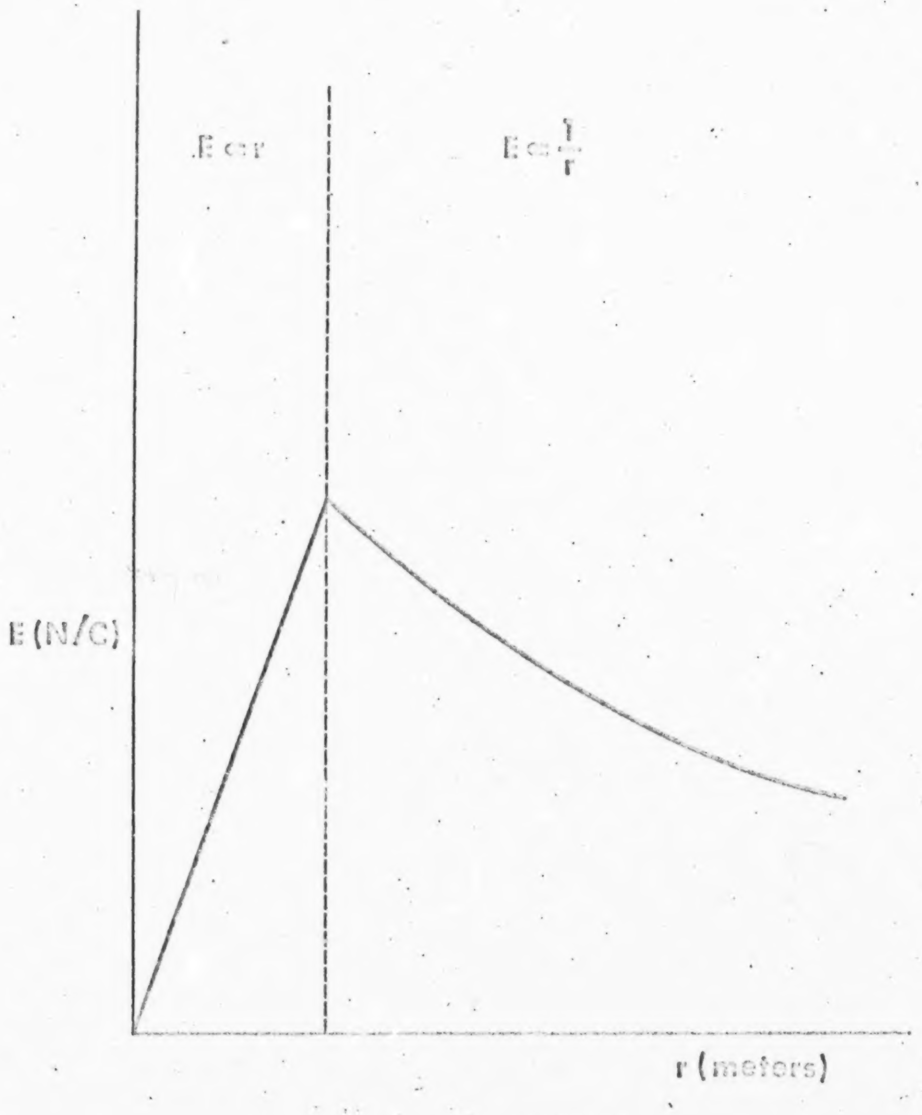
6. The figure on the left shows part of a very large plane sheet of charge with a uniform charge density $\sigma = 180\ C/m^2$. Use Gauss's law to determine the magnitude of the electric field at point P which is 2 m from the plane.



7. A non-conducting sphere is uniformily charged with a charge density $\rho = +3\ C/m^3$. The sphere has a radius of one meter. The sphere is plunged into a very cold, non-conducting liquid solution (temperature = $1^0$ K) and transforms into a conductor. What is the surface charge, σ ($C/m^2$), on the sphere? (The volume of a sphere is $4/3\ \pi r^3$ and the area is $4\pi r^2$).

8. The diagram below shows the magnitude of the electric field plotted as a function of distance. The dependence of E upon r is given by the equation shown on the diagram. Which of the following objects could produce such an electric field?

A. A uniformly charged, non-conducting cylinder
B. A charged conducting sphere
C. A charged conducting cylinder
D. Either B or C



9. In the equation for Gauss's law

$$\oint \vec{E}\cdot dA = \frac{q}{\varepsilon_0} ,$$

the q term indicates:

A. The charge enclosed by the Gaussian surface
B. The net charge enclosed by the Gaussian surface
C. The net charge enclosed by the Gaussian surface and any other charges in proximity to the Gaussian surface
D. The absolute value of the net charge enclosed by the Gaussian surface

10. A positive charge of .9 coulombs is placed at the origin of a coordinate system. A spherical surface, whose radius is 3.0 m, has its center at the origin. Find the total electric flux $\phi_E$ through the surface. (Use $\varepsilon_0 \approx 9 \times 10^{-12}\ C^2/N\text{-}m^2$.)

Physics S211

Name ____________________

ID No. ____________________

Date 8 November 1969

Section No. ________

Group Letter ________

## VOLUME 1 POST TEST

| | Answers | | Confidence | | Difficulty Rating |
|---|---|---|---|---|---|
| 1. | ☐ | | ☐ | % | ☐ |
| 2. | ☐ | N-m$^2$/C | ☐ | % | ☐ |
| 3. | ☐ | | ☐ | % | ☐ |
| 4. | ☐ | N/C | ☐ | % | ☐ |
| 5. | ☐ | | ☐ | % | ☐ |
| 6. | ☐ | N/C | ☐ | % | ☐ |
| 7. | ☐ | C/m$^2$ | ☐ | % | ☐ |
| 8. | ☐ | | ☐ | % | ☐ |
| 9. | ☐ | | ☐ | % | ☐ |
| 10. | ☐ | N-m$^2$/C | ☐ | % | ☐ |

Name________________________________ Section Number_______________

Student ID Number______________ Group Letter__________________

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Physics S211 Date 8 November 1969

## VOLUME J PRE-TEST

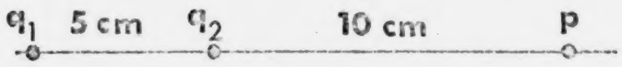
You may need the following constant:

$$\frac{1}{4\pi\varepsilon_o} = 9 \times 10^9 \text{ N-m}^2/\text{C}^2$$

1. An electric potential difference between two points, A and B, is defined to be the work per _________________ that must be done to move a positive test charge from A to B, keeping always the charge in equilibrium.

2. What is the electric potential at a distance $3 \times 10^{-3}$m from a charge of $3 \times 10^{-5}$ C.

3. Two charges $q_1 = +1.5 \times 10^{-5}$ C and $q_2 = 2 \times 10^{-5}$ C are separated by a distance of 5 cm. What is the electric potential at a point P shown in the diagram below?



4. The potential at a point located at a distance r from the center of a non-conducting sphere of radius R, charged uniformly with a total charge Q, is proportional to ______________________ for $r < R$.

Name______________________________ VOLUME J PRE-TEST

5. The electric potential at a point a distance r from a charge distribution is given by,

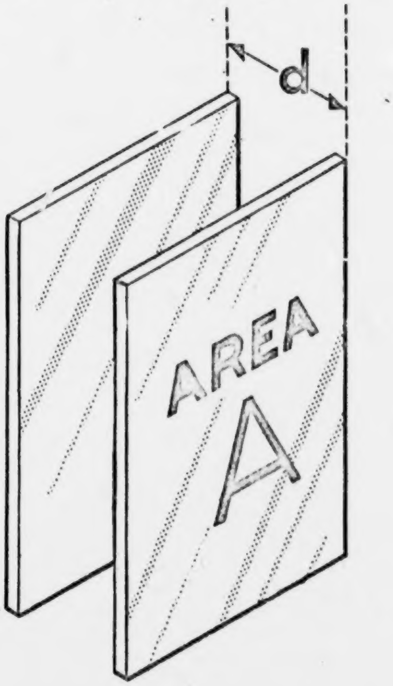
$$V(r) = 3\ r^2$$

In terms of the distance r, what is the magnitude of the field intensity at that point?

6. Two charges $q_1 = 2.0 \times 10^{-19}$ C and $q_2 = 3.0 \times 10^{-19}$ C are $6.0 \times 10^{-15}$ m apart. What is the electric potential energy of this system of charges?

7. A 2.0 microfarad television set capacitor is subject to a 3000-volt potential difference across its terminals. What is the charge on each plate of the capacitor?

8. A parallel plate capacitor shown in the diagram below consists of two parallel conducting plates of area A separated by a distance d. The charge density (charge per unit area) on each plate is + σ and - σ respectively. What is the capacitance of this capacitor?



9. What is the capacitance of the earth, viewed as a spherical conductor of radius 6300 km? (Include units).

10. What is the potential at 1 cm from the center of a non-conducting sphere of radius 1 mm, charged uniformly with a total charge of $10^{-7}$ C?

Physics S211 Divisions 8&12 Date ____________

Name ____________ Section No. ________

ID No. ________ Group Letter ________

## VOLUME J PRE-TEST

| | Answers | | Confidence | Difficulty Rating |
|---|---|---|---|---|
| 1. | | | % | |
| 2. | | V | % | |
| 3. | | V | % | |
| 4. | | | % | |
| 5. | | | % | |
| 6. | | J | % | |
| 7. | | C | % | |
| 8. | | | % | |
| 9. | | | % | |
| 10. | | V | % | |

Division 10

Name________________________

Section Number____________________

Student ID Number__________

Group Letter______________________

Physics S211

Date 15 November 1969

## VOLUME J POST-TEST

You may need the following constant:

$$\frac{1}{4\pi\varepsilon_o} = 9 \times 10^9 \text{ N-m}^2/\text{C}^2$$

1. Choose one or more of the following statements. An electric potential, $V_B - V_A$ is:

   A) directly proportional to $W_{AB}$.

   B) indirectly proportional to $-W_{BA}$.

   C) indirectly proportional to $q_o$.

   D) directly proportional to $q_o$.

2. What is the electric potential at a distance 3 m from a charge of 3 C?

3. The electric potential at a point P is $9 \times 10^5$ V. If the charge $q_1 = +1.5 \times 10^{-5}$ C, what is the magnitude of the charge $q_2$?

4. The potential at a point located at a distance r from the center of a non-conducting sphere of radius R, charged uniformly with a total charge Q, is proportional to ______________________________ for $r > R$.

5. The electric potential at a point a distance r from a charge distribution is given by,

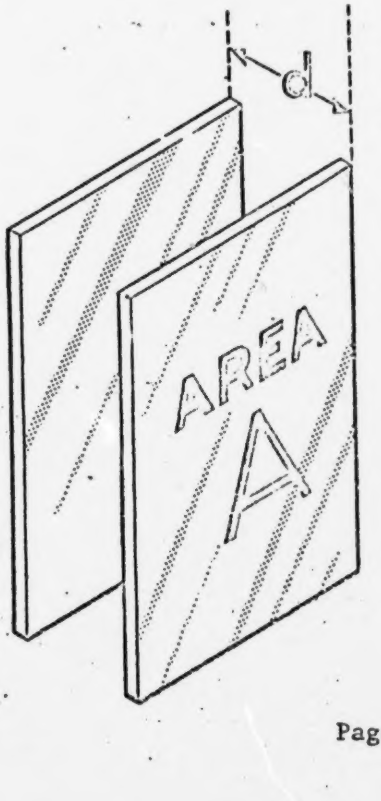
$$V\ (r) = 6r^5$$

In terms of the distance r, what is the magnitude of the field intensity at that point?

6. Two charges $q_1 = 2.0 \times 10^{-19}$ C and $q_2 = 3.0 \times 10^{-19}$ C are $6.0 \times 10^{-15}$ m apart. How much energy was expended in gathering this system of charges?

7. A 20 microfarad capacitor is subject to a 3000-volt potential difference across its terminals. What is the charge on each plate of the capacitor?

8. A parallel plate capacitor shown in the diagram below consists of two parallel conducting plates of area A separated by a distance d. The charge density (charge per unit area) on each plate is + σ and - σ respectively. What is the capacitance of this capacitor?



Name________________________________ VOLUME J POST-TEST

9. What is the capacitance of an isolated sphere of radius $r = 1.8$ meters? (include units).

10. What is the potential at 1 m from the center of a non-conducting sphere of radius 10 m, charged uniformly with a charge density of $8.8 \times 10^{-12}$ C/m$^3$. (The volume of a sphere is $\frac{4}{3}\pi r^3$ and the area of a sphere is $4\pi r^2$).

Physics Unit Division 10 Date ______

Name ______ Section No. ______

ID No. ______ Group Letter ______

## VOLUME J POST-TEST

| | Answers | | Confidence | Difficulty Rating |
|---|---|---|---|---|
| 1. | ☐ | | ☐ % | ☐ |
| 2. | ☐ | V | ☐ % | ☐ |
| 3. | ☐ | C | ☐ % | ☐ |
| 4. | ☐ | | ☐ % | ☐ |
| 5. | ☐ | | ☐ % | ☐ |
| 6. | ☐ | J | ☐ % | ☐ |
| 7. | ☐ | C | ☐ % | ☐ |
| 8. | ☐ | | ☐ % | ☐ |
| 9. | ☐ | | ☐ % | ☐ |
| 10. | ☐ | V | ☐ % | ☐ |

Name________________________________ Section Number____________

Student ID Number________________ Group Letter________________

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Physics S211

Date 15 November 1969

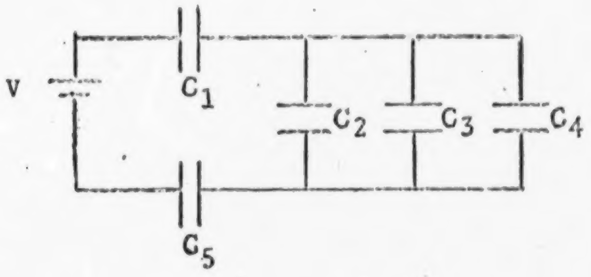
VOLUME K PRE-TEST

1. Three 10 microfarad capacitors are connected in series. What is the equivalent capacitance of this arrangement?

2. Three 10 microfarad capacitors are connected in parallel. What is the equivalant capacitance of this arrangement?

3. A potential of 20 volts is measured across a 2 Farad capacitor. What amount of energy is stored?

4. For the circuit shown below, the equivalent capacitance in μF is ____________________?



V = 12 volts

$C_1 = C_3 = 2$ microfarads

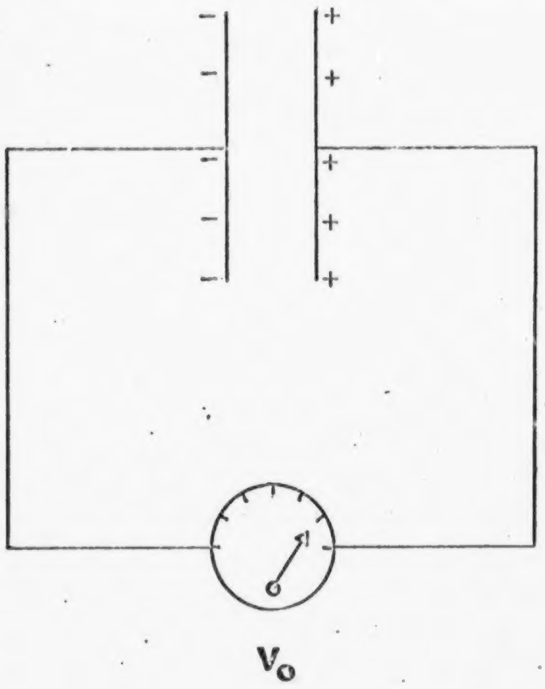
$C_2 = 1$ microfarad

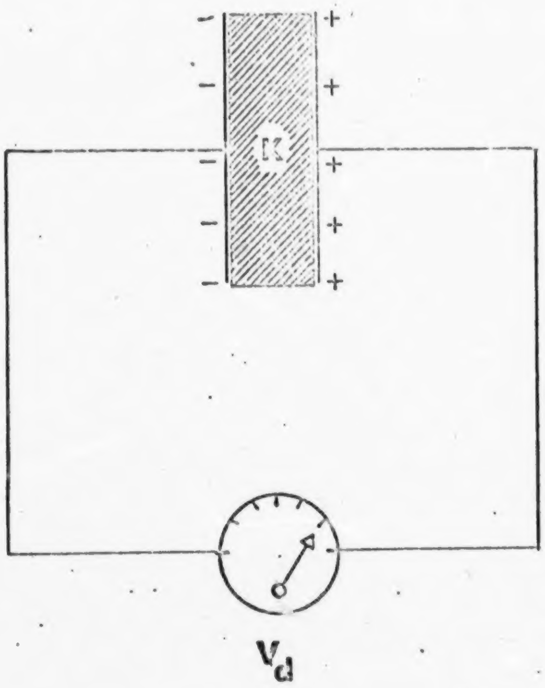
$C_4 = C_5 = 3$ microfarads

5. On the diagram for problem 4, the total charge supplied by the battery is ____________________________?

6. In the left diagram shown below, a capacitor is shown with a voltmeter measuring the potential difference $V_o$ (in volts) across the plates. In the right diagram a dielectric of constant $\kappa$ has been placed between the plates, after the battery which charged the capacitor was disconnected. A voltmeter reads the potential difference, $V_d$, across the capacitor with the dielectric.

How does the magnitude of $V_o$ compare with $V_d$?





7. The units of current is the ____________________.

8. A wire is 1 meter long and has a cross-sectional area of 0.001 square meters. The resistance of the wire is found to be 10 ohms. What is the value of the resistivity for this material?

9. A 100 ohm resistor is connected across the terminals of a 10 volt battery. What is the magnitude of the current? (include units)

10. The graph of voltage versus current for an 'ohmic' resistor will be_____________________________.

Divisions 8 and 12

Name________________________ Section No.____________________

Student ID No.________________ Group Letter____________________

Physics S211 Date 22 November 1969

## VOLUME K POST-TEST

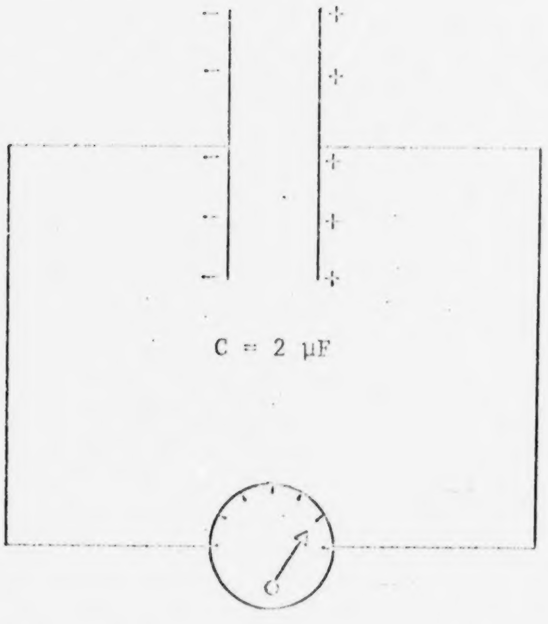
1. If a 2-farad capacitor stores 4 joules of energy, what is the potential across the capacitor?

2. The ampere is the unit of __________________. (one word)

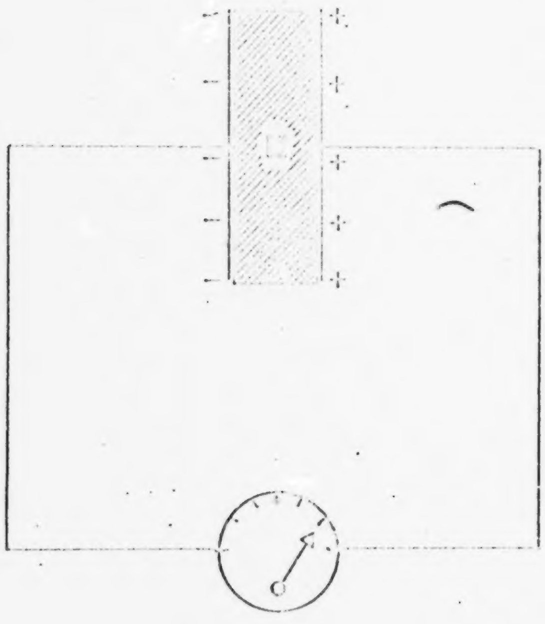
3. Three 20 microfarad capacitors are connected in series. What is the equivalent capacitance of this arrangement?

4. A wire is 2 meters long and has a cross-sectional area of 0.001 square meters. If the resistivity of the material is 0.01 ohm-m, what is the resistance of the wire?

5. In the left diagram shown below, a capacitor is shown with a voltmeter measuring the potential difference $V_o$ (in volts) across the plates. In the right diagram a dielectric of constant $\kappa$ has been placed between the plates, after the battery which charged the capacitor was disconnected. A voltmeter reads the potential difference, $V_d$, across the capacitor with the dielectric. The dielectric constant is equal to $\kappa = 4.0$. What is the value of $V_d$?

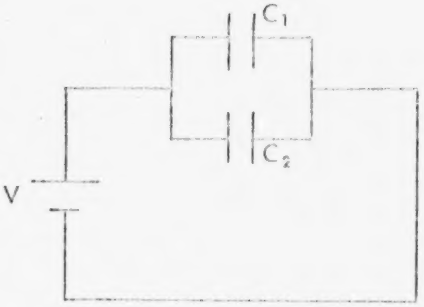


$V_o$ = 20 volts



$V_d$

6. In the diagram below, the charge on one plate of the capacitor $C_2$ is equal to



$C_1 = 1\ \mu F$

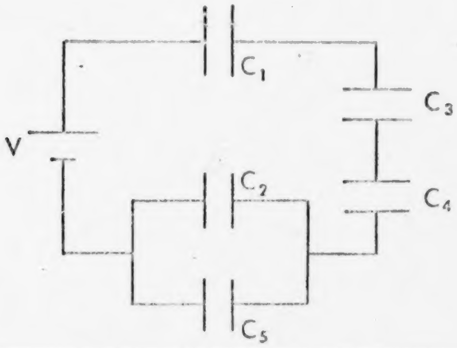
$C_2 = 10\ \mu F$

$V = 20$ volts

7. The terminals of a 20-volt battery are connected by a wire with a resistance of 100 ohm. What is the current in the wire?

8. Three 20 microfarad capacitors are connected in parallel. What is the equivalant capacitance of this arrangement?

9. For the circuit shown below, the equivalent capacitance in µF is _______________?



$V = 12$ volts

$C_1 = C_3 = 2$ microfarads

$C_2 = 1$ microfarad

$C_4 = C_5 = 3$ microfarads

Name______________________________ VOLUME K POST-TEST

10. If a graph is made of voltage versus current for a given 'ohmic' resistor, the slope of the resulting straight line will be equal to the ______________________. (one word)

Physics S211 Divisions S&12 Date 22 November 1969

Name ____________________ Section No. ____

ID No. ________ Group Letter ______

## VOLUME K POST-TEST

| | Answers | | Confidence | | Difficulty Rating |
|---|---|---|---|---|---|
| 1. | | V | | % | |
| 2. | | | | % | |
| 3. | | μF | | % | |
| 4. | | ohm | | % | |
| 5. | | V | | % | |
| 6. | | μC | | % | |
| 7. | | A | | % | |
| 8. | | μF | | % | |
| 9. | | μF | | % | |
| 10. | | | | % | |

Name ______________________ Section Number __________

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Physics S211 22 November 1969

## VOLUME I. PRE-TEST

1. A source (or seat) of electromotive force (emf) can be described as a device in which chemical, mechanical, or some other form of energy is changed into ________________ energy. (Fill in one word.)

2. Joule's law applies only to resistors and may be written as: (Choose the correct form; there may be more than one!)

   A. $P = i^2R$

   B. $P = V^2/R$

   C. $P = iV$

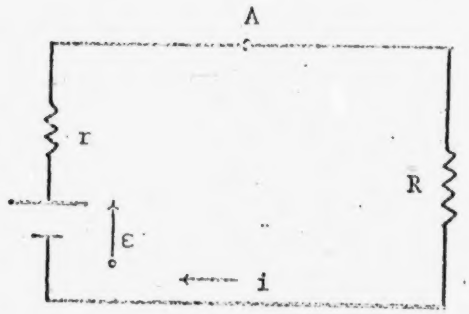
   D. $P = V/i^2$

3. A 2-ohm resistor is placed in a coffee cup filled with water. If a 2-ampere current flows through this resistor, how many joules of electrical energy are converted into heat by the resistor in every second?

Name ______________________________

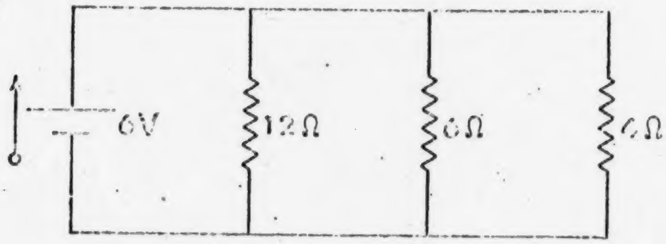
4. In the figure shown below, the following values are known:

$\varepsilon$ = 10 volts
r = 1.5 ohms
R = 3.5 ohms.

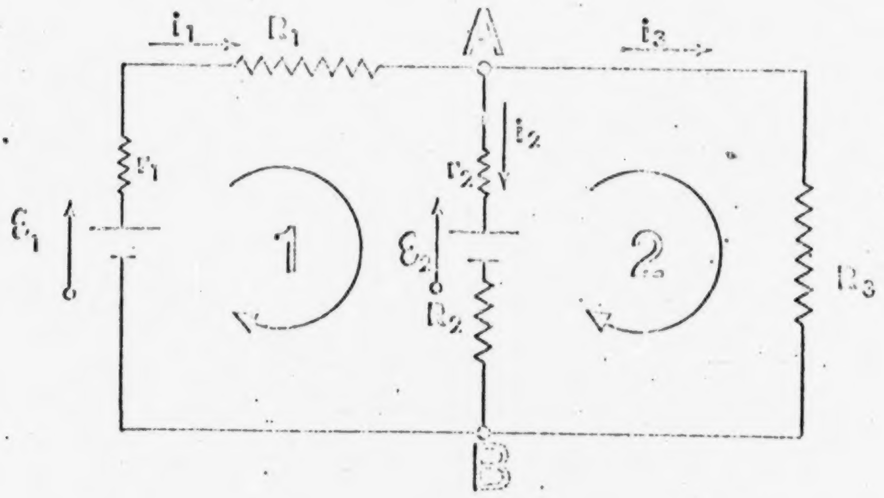


What is the value of the current $i$ (include units)?

5. In the figure shown below, the equivalent resistance of the circuit is ______________________________.

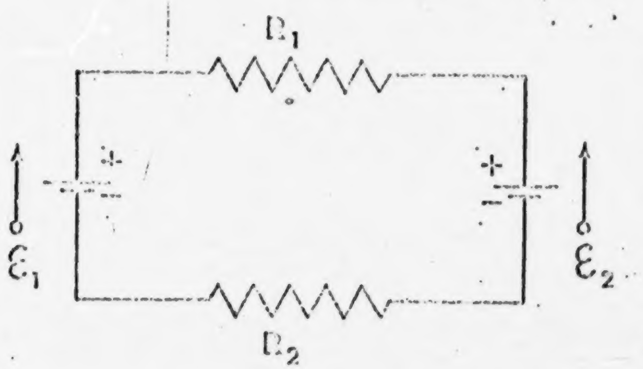


6. In the figure shown below, how many "branch points" and how many loops can you find?



$i_1$
$R_1$
A
$i_3$
$r_1$
$\mathcal{E}_1$
1
$i_2$
$r_2$
$\mathcal{E}_2$
$R_2$
2
$R_3$
B

7. The values of the components of the circuit shown below are



$R_1$
+
+
$\mathcal{E}_1$
$\mathcal{E}_2$
$R_2$

$R_1 = 9\ \Omega$ ,
$R_2 = 3\ \Omega$ ,
$\varepsilon_1 = 6$ V ,
$\varepsilon_2 = 12$ V ,
$r_1 = 0.6\ \Omega$ ,
$r_2 = 0.4\ \Omega$ ,

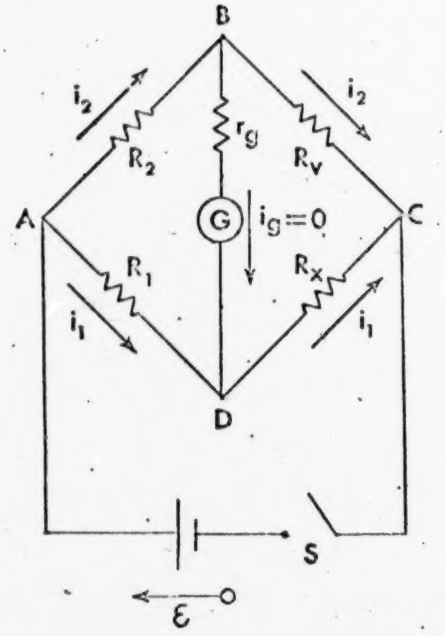
where $\underline{r}$ represents the internal resistance of a source of emf. Calculate the current $i$ in the circuit.

Name ______________________________

8. An ideal ammeter would have ______________________________ resistance.
(Fill in one word.)

9. An ideal voltmeter would have ______________________________ resistance.
(Fill in one word.)

10. The diagram below shows a circuit used to measure unknown resistances with great precision.


B
$i_2$
$r_g$
$R_2$
$R_v$
$i_2$
A
G
$i_g = 0$
C
$R_1$
$R_x$
$i_1$
$i_1$
D
S
$\mathcal{E}$

Such a circuit is called a ______________________________.
(Fill in two words.)

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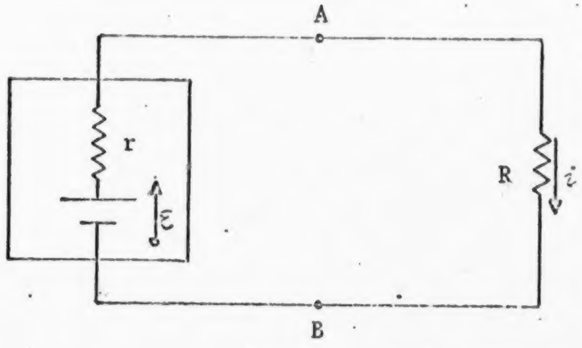
Physics S211 4 December 1969

VOLUME L POST-TEST

1. A current flows through a resistor in an electrical circuit. In terms of the current $i$ and the resistance R, what is an expression for the rate of energy dissipated by the resistor?

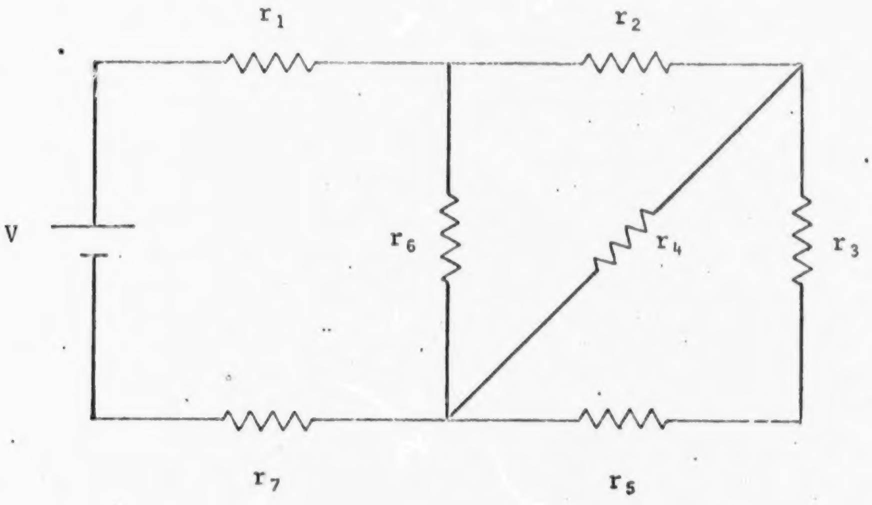
2. In the figure shown below, the following values are known:

$\varepsilon = 10$ volts
$r = 1.5$ ohms
$R = 3.5$ ohms.



What is the value of $V_B - V_A$?

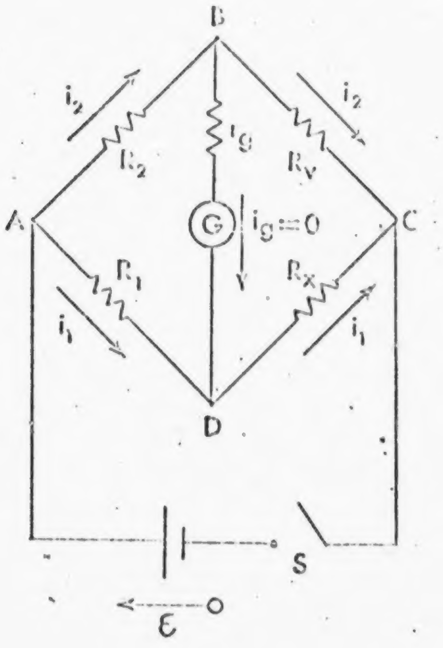
3. In the figure shown below, what is the minimum number of "branch points" and the minimum number of independent "loops" that are sufficient for the analysis of the circuit by the use of Kirchhoff's rules.



4. A real ammeter would have ______________________ resistance. (Fill in one word.)

Name ______________________________ VOLUME I. POST-TEST

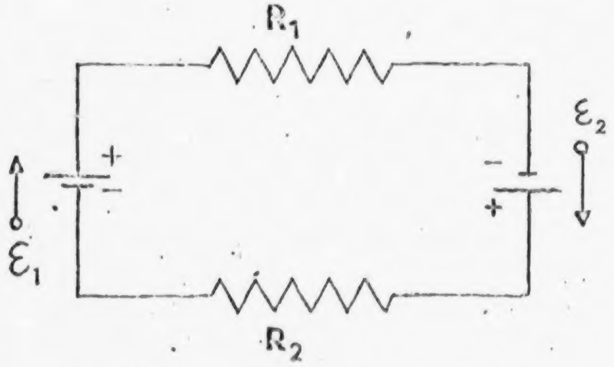
5. The diagram below shows a circuit called a Wheatstone bridge.


B
$i_2$
$i_2$
$R_2$
$i_g$
$R_V$
A
G
$i_g = 0$
C
$R_1$
$R_x$
$i_1$
$i_1$
D
S
$\mathcal{E}$

Such a circuit is used to measure ______________________________.
(Fill in one word.)

6. A real voltmeter has a very large resistance in order to ensure accurate measurement of ______________________. (Fill in one word.)

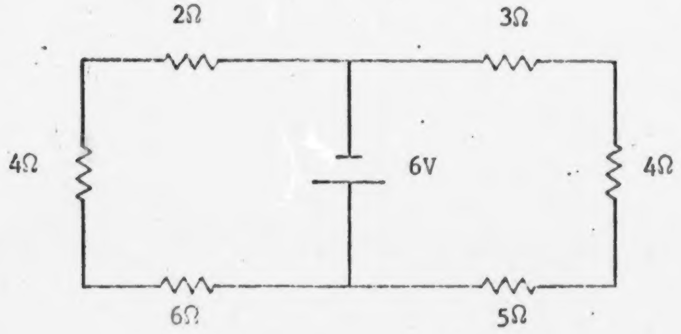
7. The values of the components of the circuit shown below are


$R_1$
$R_2$
$\varepsilon_1$
$\varepsilon_2$
+
-

$R_1 = 9\Omega$
$R_2 = 3\Omega$
$\varepsilon_1 = 6V$
$\varepsilon_2 = 20V$
$r_1 = 0.6\Omega$
$r_2 = 0.4\Omega$

where r represents the internal resistance of a source of emf. Calculate the current $i$ in the circuit.

8. In the figure shown below, the equivalent resistance of the circuit is ______________________________.


2Ω
3Ω
4Ω
6V
4Ω
6Ω
5Ω

9. A certain 5-ohm resistor dissipates heat at the rate of 3 watts. If the current through the 5-ohm resistor is tripled, what is the new rate of heat loss?

10. From the following list of electrical devices, choose the one (or ones) that is (or are) a source(s) of electromotive force (emf):

A. electroscope
B. Wheatstone bridge
C. potentiometer
D. dry cell

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## VOLUME L POST-TEST

| | Answers | Confidence | Difficulty Rating |
|---|---|---|---|
| 1. | ☐ | ☐ % | ☐ |
| 2. | ☐ V | ☐ % | ☐ |
| 3. | b.p. ☐ loops ☐ | ☐ % | ☐ |
| 4. | ☐ | ☐ % | ☐ |
| 5. | ☐ | ☐ % | ☐ |
| 6. | ☐ | ☐ % | ☐ |
| 7. | ☐ A | ☐ % | ☐ |
| 8. | ☐ ohms | ☐ % | ☐ |
| 9. | ☐ watts | ☐ % | ☐ |
| 10. | ☐ | ☐ % | ☐ |

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Division 8

# ANSWERS
# TO
# VOLUME L POST-TEST

| *Question* | *Terminal Objective* | *Answer* |
|---|---|---|
| 1 | 088 | $i^2R$ |
| 2 | 090 | -7.0 V |
| 3 | 092 | 3 b.p., 6 loops |
| 4 | 094 | small |
| 5 | 096 | resistance |
| 6 | 095 | voltage |
| 7 | 093 | 2 A |
| 8 | 091 | 6 ohms |
| 9 | 089 | 27 watts |
| 10 | 087 | D |

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## VOLUME M PRE-TEST

1. In the absence of gravitational and electric fields, if we fire a test charge $q_o$ with a velocity $\vec{v}$ through a point P in several different directions and observe no change in the test's charges velocity, we can conclude that the magnetic field at point P is ____________ (one word).

2. The tangent to a line of induction gives the ____________ of $\vec{B}$ at that point. (Fill in one word.)

3.

### UNITS of "B"
### (a vector quantity)

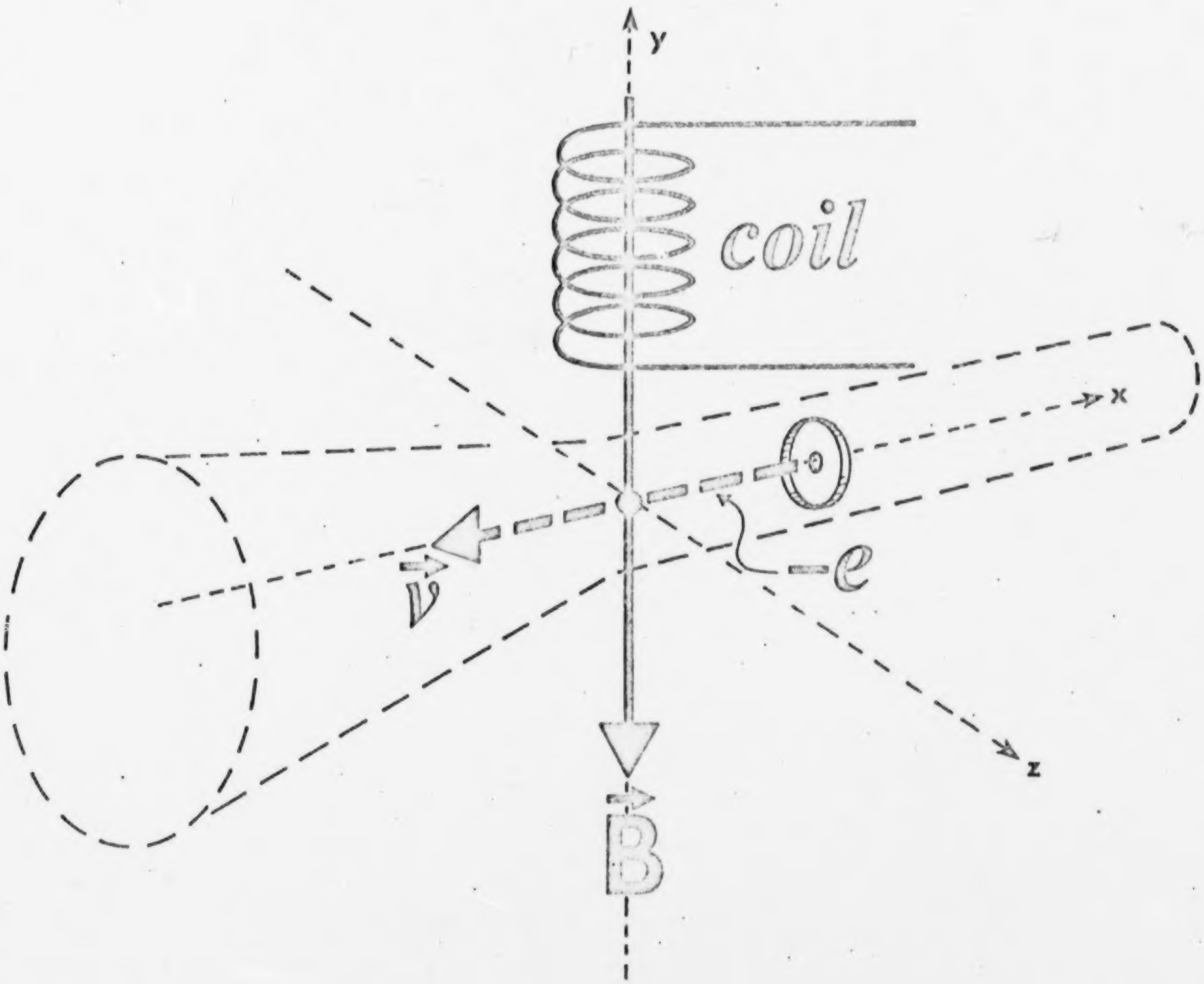
$$\frac{nt}{coul\,(m/s)} = \frac{nt}{amp\ m}$$

$$\frac{weber}{m^2} =$$

In the above, the missing unit is the ____________ (one word).

Name ____________________ VOLUME M PRE-TEST

4. The diagram below shows the outline of a cathode-ray tube with electrons streaming out along the negative x-axis. A coil causes a magnetic field $\vec{B}$ in the negative y-direction. What must be the direction of an electric field in order to cause the electron to pass through the tube undeflected?

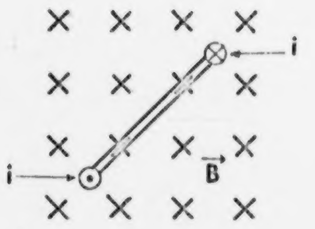


Name ______________________  VOLUME M PRE-TEST

5. If the earth can be considered to be a large magnet, what continent is closest to the north pole of the earth's magnet?

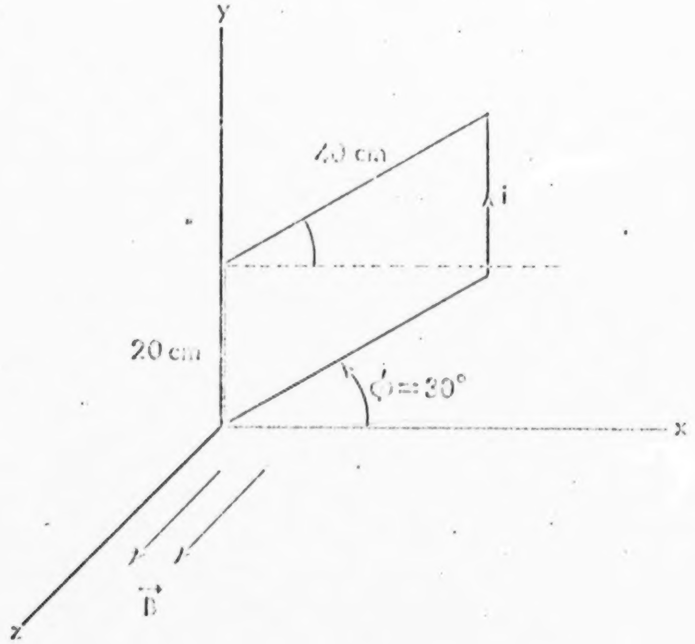
6. A 1-meter rod carrying a current of 1A is placed in a magnetic field. If a force of 1N is measured as acting upon the rod, what is the component of the magnetic induction (in gauss) perpendicular to the rod?

7. Through the loop shown below a 2-amp current flows. The square loop is one meter on edge and makes an angle of 30° with the bottom of the paper. If the magnetic field has a magnitude of $10^4$ gauss, and is into the paper, what is the magnitude of the torque on the loop?



8. A galvanometer is a device used to measure ______________ (one word).

9. A rectangular coil has 50 turns and carries a current of 10 A. It is hinged such that it is free to rotate about the y-axis (see diagram).



There is a uniform magnetic field in the region given by $\vec{B} = 3.8 \times 10^{-3}\ \hat{k}$ T. What is the torque on the coil at the instant the angle between the plane of the coil and the xy-plane is $\phi = 30°$ (toward the negative z-axis)?

Name ______________________ VOLUME M PRE-TEST

10. The charge to mass ratio for an electron is $e/m = 1.76 \times 10^{+11}$ C/kg. If an electron is shot into a region perpendicular to the magnetic field, what is the radius of the circular path of the electron. The velocity of the electron is $1.76 \times 10^3$ m/s and the magnetic field has a magnitude of $10^4$ gauss.

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## VOLUME M PRE-TEST

| | Answers | | Confidence | Difficulty Rating |
|---|---|---|---|---|
| 1. | | | % | |
| 2. | | | % | |
| 3. | | | % | |
| 4. | | | % | |
| 5. | | | % | |
| 6. | | gauss | % | |
| 7. | | N-m | % | |
| 8. | | | % | |
| 9. | | N-m | % | |
| 10. | | m | % | |

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# ANSWERS

# TO

# VOLUME M PRE-TEST

| *Question* | *Terminal Objective* | *Answer* |
|---|---|---|
| 1 | 097 | zero |
| 2 | 098 | direction |
| 3 | 099 | tesla (or $10^4$ gauss |
| 4 | 100 | negative z-direction |
| 5 | 101 | Antarctica |
| 6 | 102 | Tesla (or $10^4$ gauss) |
| 7 | 103 | 2 N-m |
| 8 | 104 | current |
| 9 | 105 | $-76 \times 10^{-3}\ \hat{j}$ N-m |
| 10 | 106 | $1 \times 10^{-8}$ m |

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VOLUME M POST-TEST

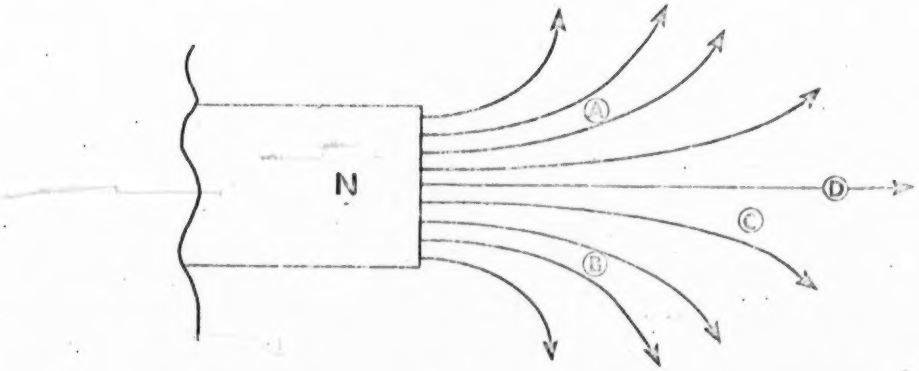
1. Which of the following is true about a uniform magnetic field? (There may be more than one, or there may be none.)

   A. The unit of magnetic field is the weber.

   B. Magnetic and electric fields can be added directly.

   C. The force on a charge moving in a magnetic field will always be perpendicular to the velocity of the charge.

2.



From the above diagram decide upon one or more of the following:

   A. Points A and B represent points of equal potential.

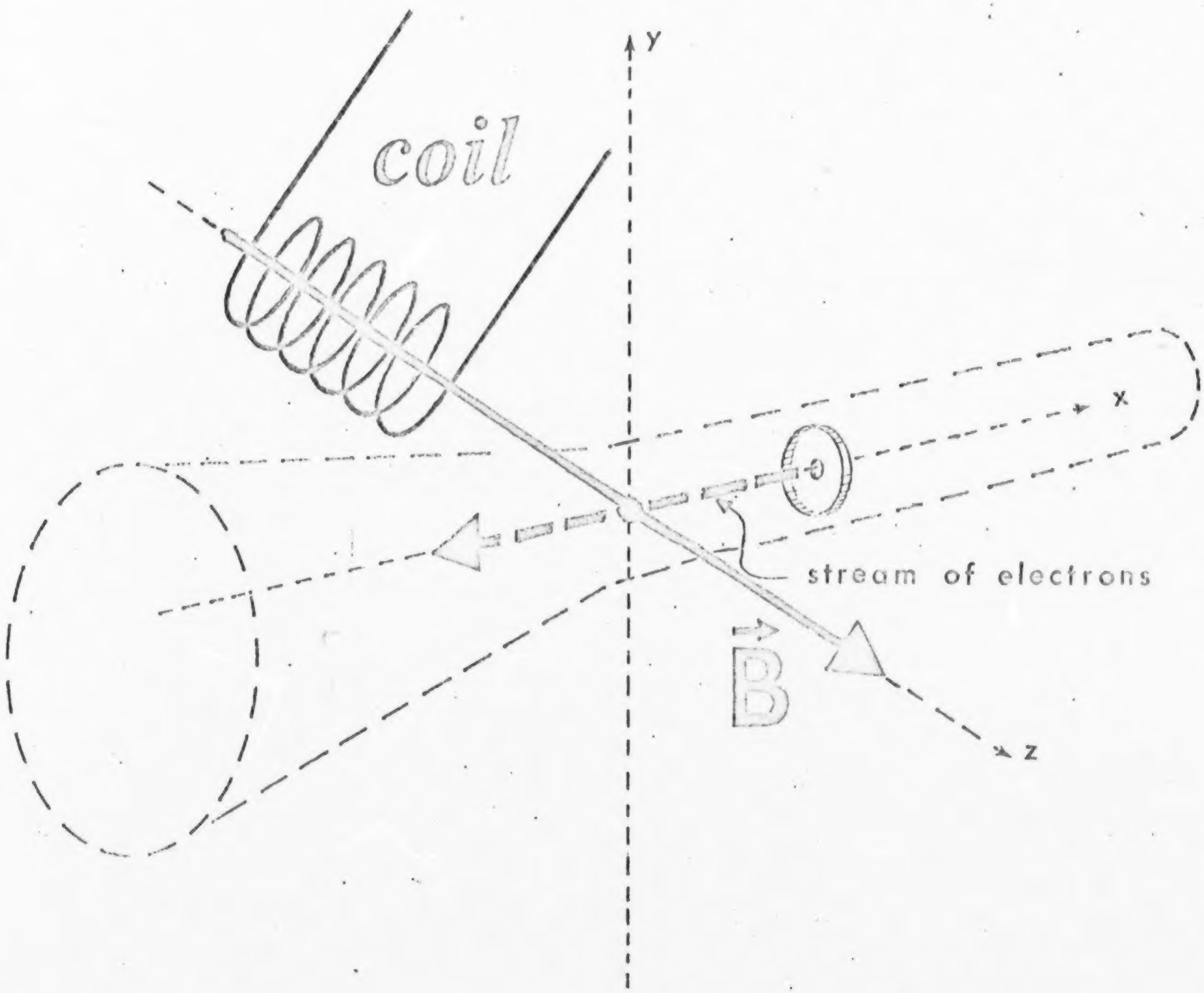
   B. At point A, the magnetic field is the largest in magnitude.

   C. The direction of the magnetic field at point D is to the right.

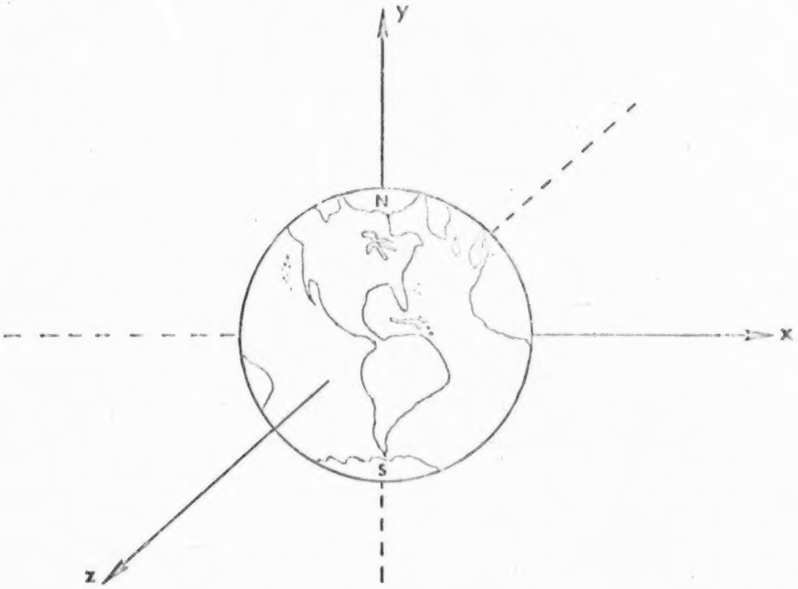
   D. The direction of the magnetic field at point B is perpendicular to the line of induction at that point.

3. A magnetic field is found to have a strength of $10^4$ gauss. What is the magnitude of this field in MKS units?

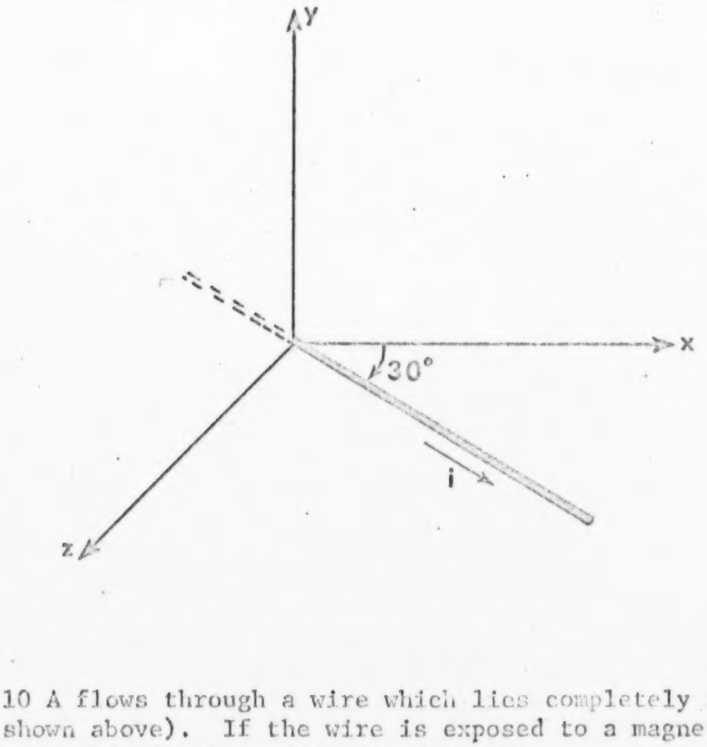
4. The diagram below shows the outline of a cathode-ray tube with electrons streaming out along the negative x-axis. A coil produces a magnetic field $\vec{B}$ in the positive z-direction. What must be the direction of an electric field in order to cause the electrons to pass through the tube undeflected?



5. If you were tracing the magnetic lines of induction around the earth (shown below), in which direction would you draw if you started at the equator.

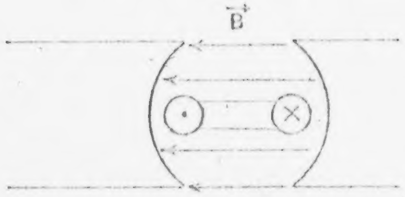


6.

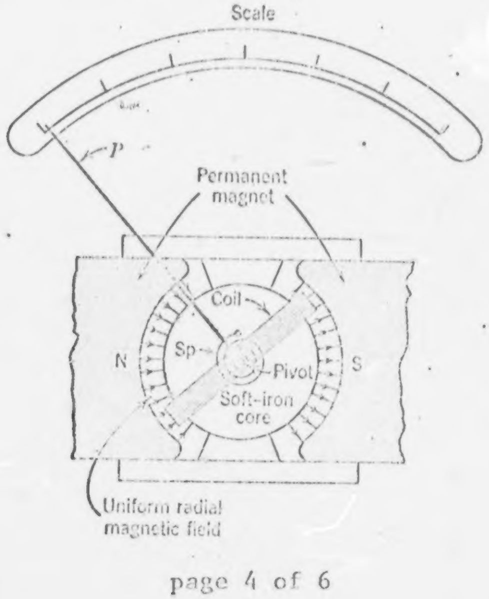


A current of 10 A flows through a wire which lies completely in the xz-plane (as shown above). If the wire is exposed to a magnetic field $B = +10\,\hat{k}$ tesla, what is the magnitude of the force per unit length on the wire?

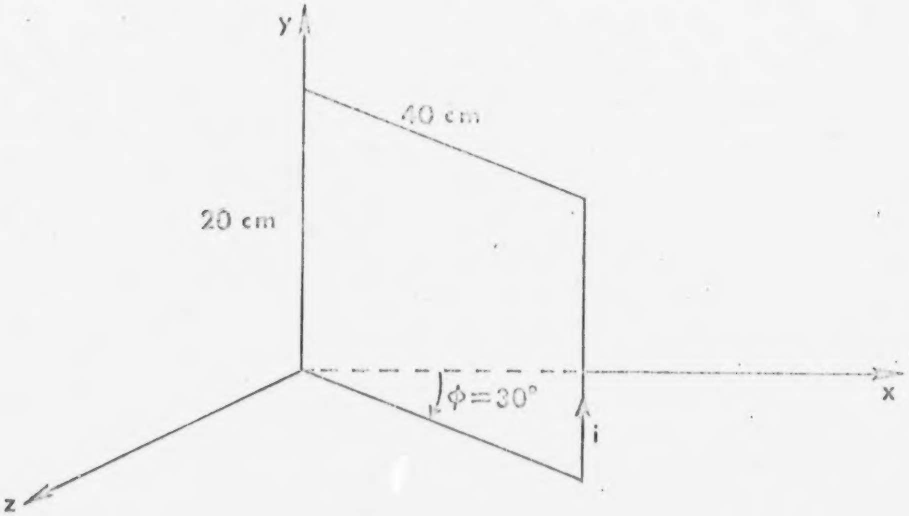
7. The loop shown in the figure below would turn in the ______________ direction.



8. The coil of a galvanometer is 2.0 cm high and 1.0 cm wide and has 250 turns. The coil is exposed to a uniform magnetic field $B = 2000$ gauss. If a current of $1 \times 10^{-4}$ A produces an angular deflection of 30°, what deflection does a current of $2 \times 10^{-4}$ A produce? (Hint: $\tau = NiAB = \kappa\phi$.)


Scale
P
Permanent magnet
Coil
Sp
Pivot
N
S
Soft-iron core
Uniform radial magnetic field

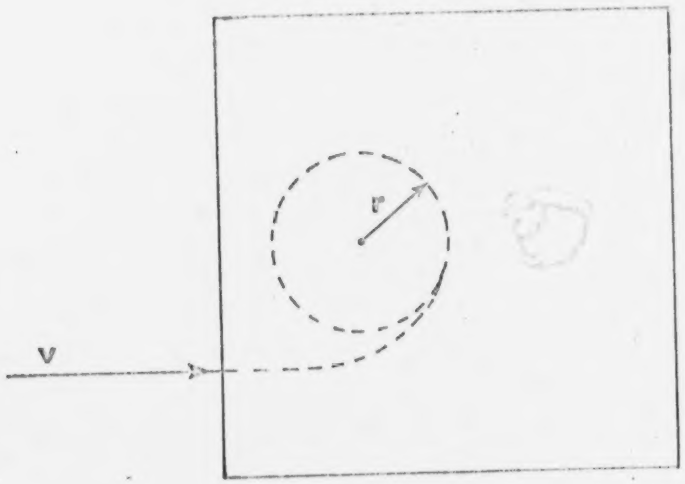
9. A rectangular coil has 50 turns and carries a current of 10 A. It is hinged such that it is free to rotate about the y-axis (see diagram).



There is a uniform magnetic field in the region given by $\vec{B} = -10 \times 10^{-3}\ \hat{i}$ T. What is the magnitude of the torque on the coil at the instant the angle between the plane of the coil and the xy-plane is $\phi = 30°$?

Name ______________________

10. The charged particle shown in the diagram below is deflected by a magnetic field and moves in a circle of radius equal to 8 cm. If the B-field and the charge were doubled in magnitude but the initial velocity remained constant, what would be the new radius of the moving charge?



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Group Letter ______

## VOLUME M POST-TEST

| | Answers | | Confidence | | Difficulty Rating |
|---|---|---|---|---|---|
| 1. | | | | % | |
| 2. | | | | % | |
| 3. | | | | % | |
| 4. | | | | % | |
| 5. | | | | % | |
| 6. | | N/m | | % | |
| 7. | | | | % | |
| 8. | | degrees | | % | |
| 9. | | N-m | | % | |
| 10. | | cm | | % | |

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VOLUME N PRE-TEST

1. According to which of the following rules can the sense of the magnetic field lines generated by a current be determined?

   A. With the thumb of the left hand pointing in the direction of the current, the fingers will curl in the same sense as the magnetic field lines.

   B. With the thumb of the right hand pointing in the direction of the current, the fingers will curl in the same sense as the magnetic field lines.

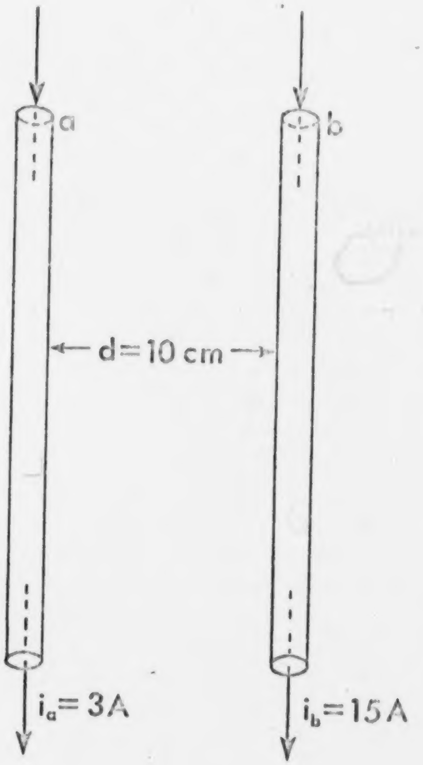
   C. With the thumb of the right hand pointing in the direction of the electron flow, the fingers curl in the same sense as the magnetic field lines.

   D. Both statements A and C above.

2. An infinitely long cylindrical wire of diameter 1 cm carries a current of 6 mA uniformly distributed over its cross-section. Use Ampère's law to calculate the magnitude of the magnetic induction at a distance of 5 cm from the center of the wire.

3. Use Ampère's law to calculate the magnitude of the magnetic induction at a distance of 2 mm from the center of an infinitely long cylindrical wire of diameter 1 cm which carries a current of 6 mA uniformly distributed over its cross section.

4. Two long parallel conductors separated by a distance d = 10 cm carry parallel currents of $i_a = 3$ A and $i_b = 15$ A (see diagram). Calculate the magnitude of the (attractive) force per unit length on each conductor due to the current in the other conductor.



5. When the unit of current (the ampere) is defined in terms of the mutual force between two parallel, long, current-carrying conductors, the value of the permeability constant, $\mu_o$, is

A. set at $2 \times 10^{-7}$ N/A$^2$.

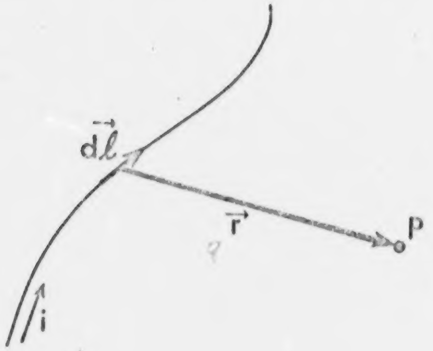
B. measured to be $2 \times 10^{-7}$ N/A$^2$.

C. measured to be $4\pi \times 10^{-7}$ N/A$^2$.

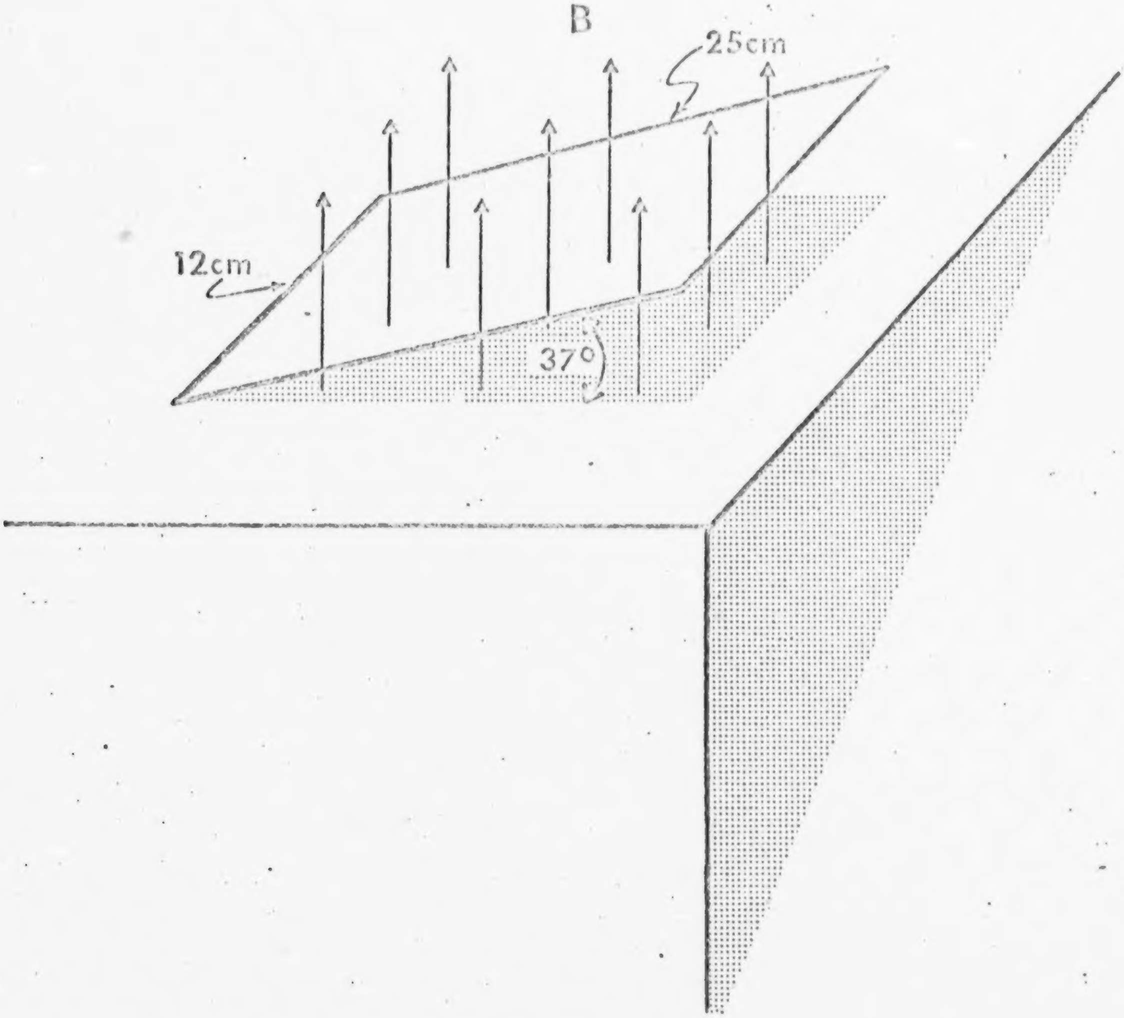
D. set at $4\pi \times 10^{-7}$ N/A$^2$.

6. A long solenoid has a diameter of 5 cm, and a number of turns per unit length n = 500 turns/m. What is the magnitude of the magnetic induction at the center of the solenoid, when the current in it is 1.5 A?

7. Use the Biot-Savart law to express the contribution of the current element $d\vec{\ell}$ to the magnetic induction at the field point P, which is located at a position $\vec{r}$ relative to $d\ell$.



8. A closely wound rectangular 50-turn coil has dimensions of 12 cm × 25 cm. It is located in a uniform magnetic field of B = 2 T, oriented as shown in the diagram. If the loop is brought from its position as indicated to the horizontal position in 0.1 s, what is the magnitude of the average emf induced?



9. If the south pole of the magnet in Figure A is moving toward the loop (toward left), the current in the loop is (the magnet is parallel to the axis of the loop) .

   A. clockwise.
   B. counterclockwise.
   C. zero.
   D. decreasing in the counterclockwise direction.

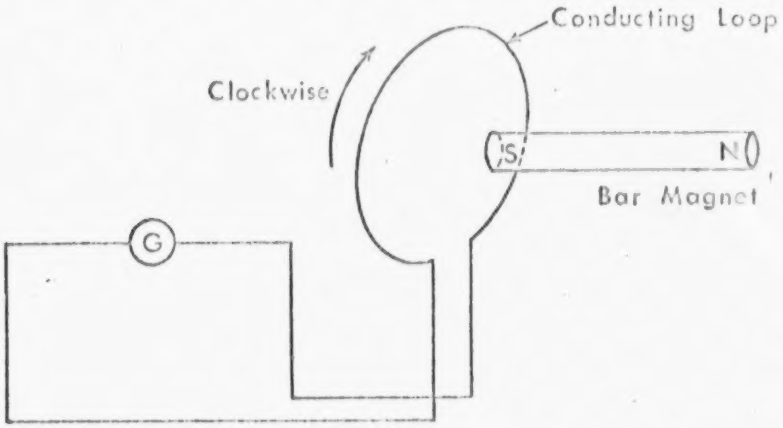
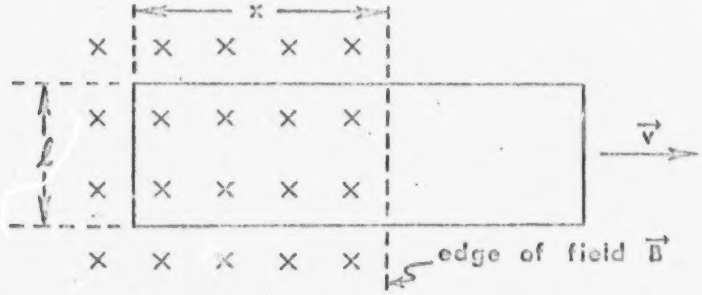

Conducting Loop
Clockwise
S
N
Bar Magnet
G

Figure A

10. A closed conducting loop of width ℓ and length x is moved to the right at a constant speed v in a region where a magnetic field B exists. The resistance of the loop is R. If the field is uniform and normal to the plane of the loop, the induced emf in the loop at the instant shown is given by


x
ℓ
$\vec{v}$
edge of field $\vec{B}$

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## VOLUME N PRE-TEST

| | Answers | | Confidence | Difficulty Rating |
|---|---|---|---|---|
| 1. | ☐ | | ☐ % | ☐ |
| 2. | ☐ | T | ☐ % | ☐ |
| 3. | ☐ | T | ☐ % | ☐ |
| 4. | ☐ | N | ☐ % | ☐ |
| 5. | ☐ | | ☐ % | ☐ |
| 6. | ☐ | T | ☐ % | ☐ |
| 7. | ☐ | | ☐ % | ☐ |
| 8. | ☐ | V | ☐ % | ☐ |
| 9. | ☐ | | ☐ % | ☐ |
| 10. | ☐ | | ☐ % | ☐ |

Division 10

Name______________________ Section Number__________

Student ID Number______________________ Group Letter__________

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Physics S211

Date 18 December 1969

## VOLUME N POST-TEST

1. Which of the following statements are correct (there may be more then one).

   A. The direction of the magnetic induction lines produced by a current-carrying conductor is established by making use of the right-hand rule; i.e., with the thumb of the right hand pointing in the direction of the current, the right-hand finger will work in the same sense as the magnetic induction line.

   B. The direction of the magnetic induction lines produced by a current carrying conductor may also be determined by making use of the left-hand rule; i.e., with the thumb of the left hand proceeding in the direction of the current, the left-hand finger will curl around the conductor in the same sense as the magnetic induction lines.

   C. The direction of the magnetic induction lines produced by a current-carrying conductor is established by making use of the right-hand rule; i.e., with the thumb of the right-hand pointing in the direction of the electron flow, the right-hand finger will work in the same sense as the magnetic induction line.

   D. The magnetic induction lines around a long, straight, current-carrying wire are circles whose centers are located at the axis of the wire and whose planes are normal to the axis of the wire.

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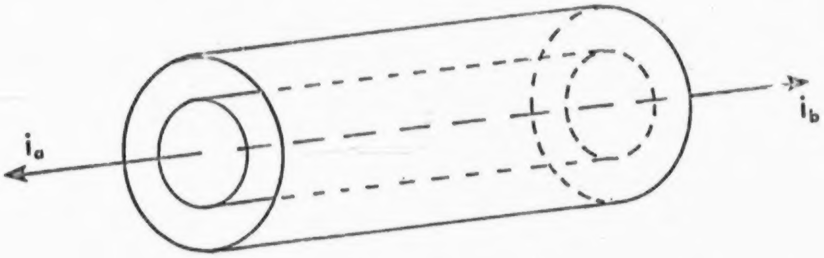
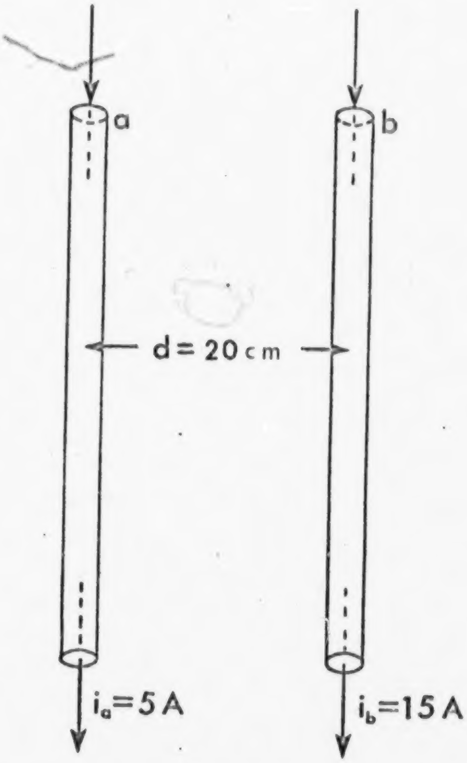
2. A long cable consists of two coaxial conductors, a solid inner wire of radius a = 5 mm and a thin outer shell of radius b = 1 cm. The two conductors carry equal currents ($i_a = i_b = 10$ A) but in opposite directions. Use Ampère's law to calculate the magnitude of the magnetic induction at a point midway between the two conductors; i.e., at a distance of 7.5 mm from the axis of the cable.



3. Use Ampère's law to calculate the magnitude of the magnetic induction at a distance of 0.1 cm from the center of an infinitely long cylindrical wire of diameter 0.4 cm which carries a current of 6 A uniformly distributed over its cross section.

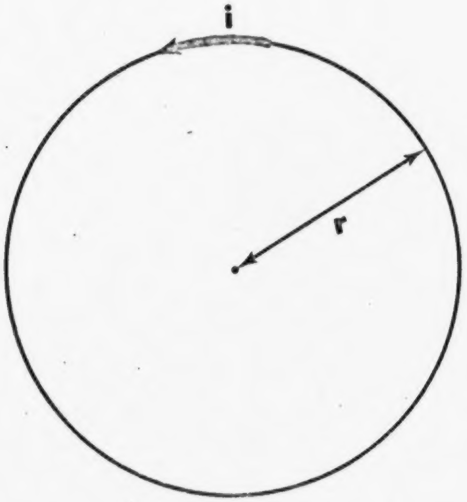
4. Two long parallel conductors separated by a distance d = 20 cm carry parallel currents of $i_a$ = 5 A and $i_b$ = 15A (see diagram). Calculate the magnitude of the (attractive) force per unit length of each conductor due to the current in the other conductor.



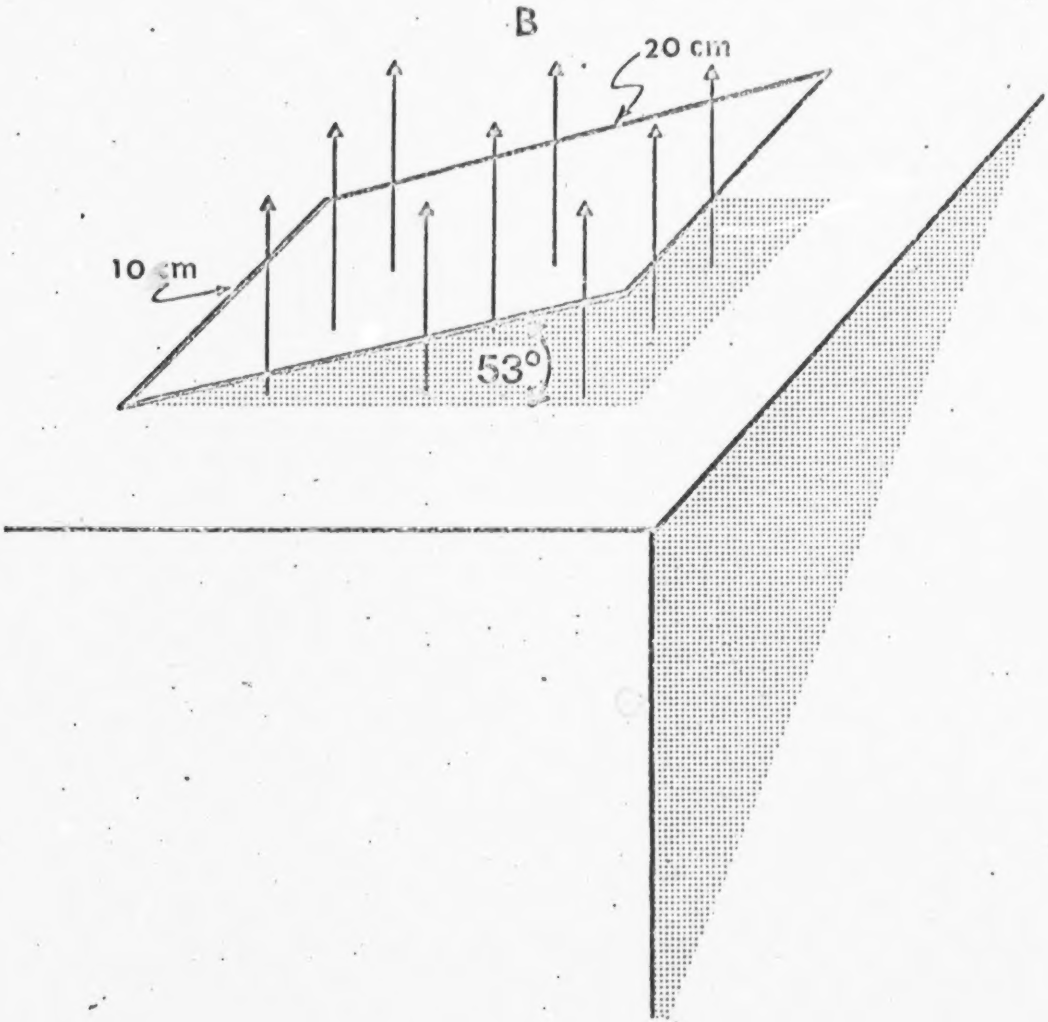
5. A current balance is an instrument used for precise measurements of currents. If the current in the two parallel rods of the current balance is 1 A and the axes of the rods are separated by a distance of 1 m, what is the magnetic force between the two rods?

6. A long solenoid has a radius of 1.5 cm, and a number of turns per unit length n = 500 turns/m. What is the magnitude of the magnetic induction at the center of the solenoid, when the current in it is 5 A?

7. Use the Biot-Savart law to calculate the magnitude of the magnetic induction at the center of a circular loop of radius r = 30 cm carrying a current $i$ = 3 A.

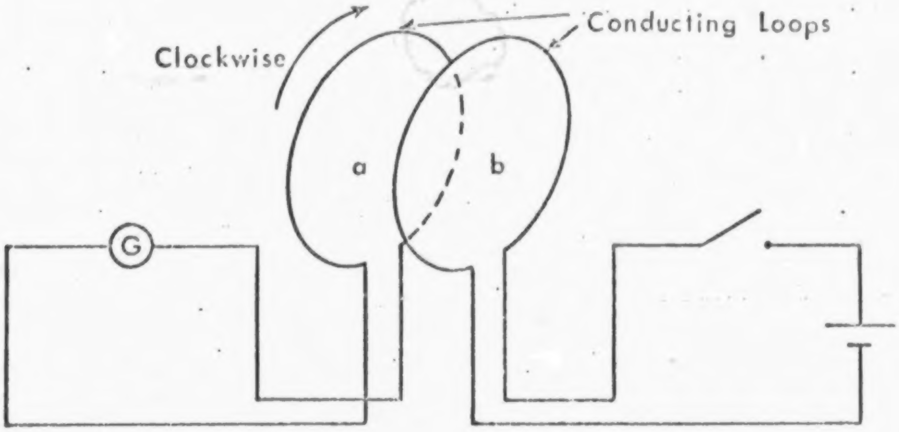


8. A closely wound rectangular 50-turn coil has dimensions of 10 cm × 20 cm. It is located in a uniform magnetic field of $B = 2$ T, oriented as shown in the diagram. If the loop is brought from its position as indicated to the horizontal position in 0.1 s, what is the magnitude of the average emf induced?

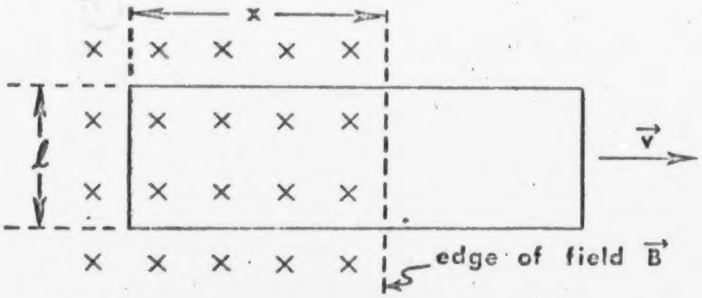


9. Immediately after the switch in circuit b is opened the current through the galvanometer in circuit a will be (select the appropriate one(s))

   A. clockwise.
   B. from left to right.
   C. from right to left.
   D. zero.


Clockwise
Conducting Loops
a
b
G

10. A closed conducting loop of width ℓ = 30 cm is moved to the right at a constant speed v = 5 m/s in a region where a magnetic field B = 0.2 T exists. If the resistance of the loop is R = 3 Ω, what is the induced current through the loop at the moment a length x = 2 m of the loop is in the field?


x
ℓ
$\vec{v}$
edge of field $\vec{B}$

Physics S211 -- Division 10

Date 18 December 1969

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VOLUME N POST-TEST

| | Answers | | Confidence | Difficulty Rating |
|---|---|---|---|---|
| 1. | ☐ | | ☐ % | ☐ |
| 2. | ☐ | T | ☐ % | ☐ |
| 3. | ☐ | T | ☐ % | ☐ |
| 4. | ☐ | N | ☐ % | ☐ |
| 5. | ☐ | N | ☐ % | ☐ |
| 6. | ☐ | T | ☐ % | ☐ |
| 7. | ☐ | T | ☐ % | ☐ |
| 8. | ☐ | V | ☐ % | ☐ |
| 9. | ☐ | | ☐ % | ☐ |
| 10. | ☐ | A | ☐ % | ☐ |

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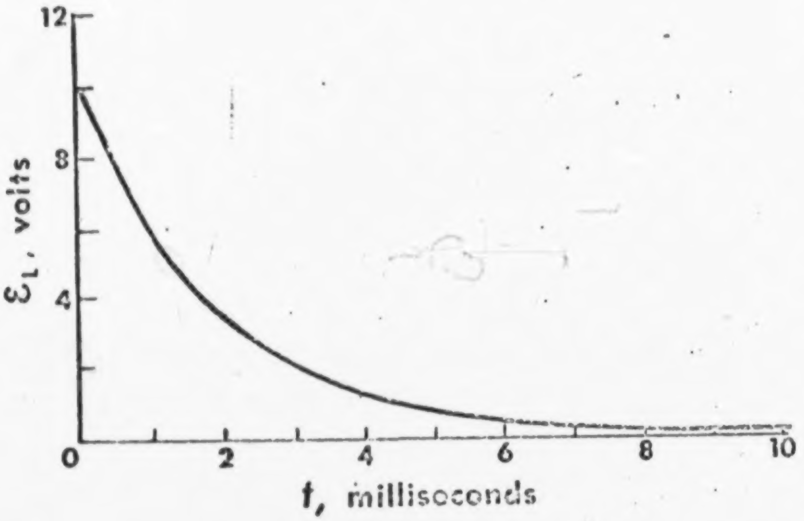
Physics S211

## VOLUME O PRE-TEST

1. In an RL circuit, the current decays to 37% of its equilibrium value in 10 s. What is the time constant of the circuit?

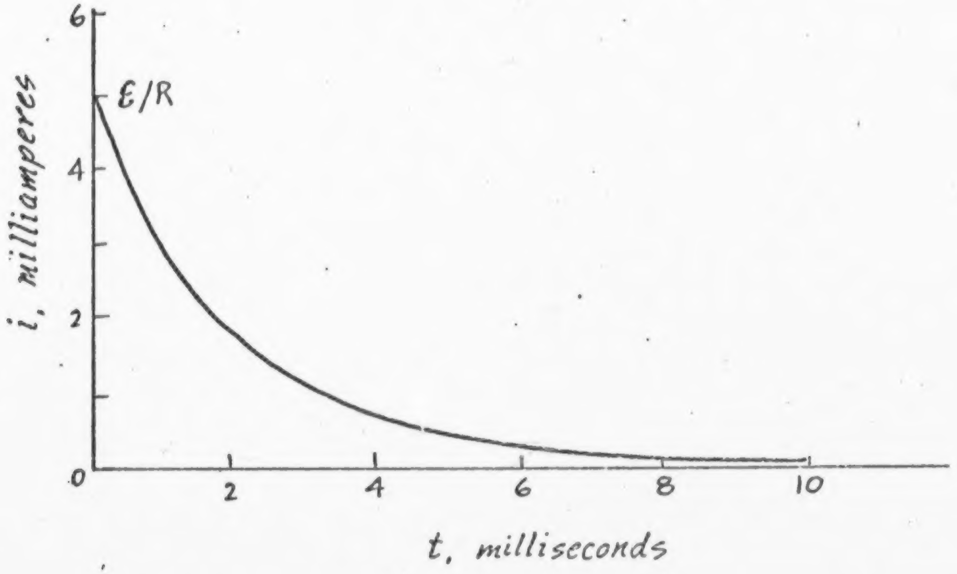
2. The curve given below shows the variation of the potential difference $\varepsilon_L$ across the inductor with t of an LR circuit. What is the voltage after two time constants?



3. A coil with resistance of 20 ohms and inductance of 0.5 henry is connected to a 120 volt D.C. line. At what rate will the current in the coil rise at the instant the current reaches 50% of its maximum value?

4. A capacitor in an RC circuit has been fully charged at 200 volts. If the resistance is 20 ohms, what is the magnitude of current in this circuit one time constant after the capacitor begins discharging?

5. Can you find the time constant of an RC circuit whose variation of current with time is given in the following curve?



Name_______________________________

6. What is the current in an RC circuit with a resistor (R = 10 ohms) due to a 100 volt emf one time constant after the voltage is applied? [$e^{-1} = .37$]

7. A coil has 200 turns. A direct current of 2A in the coil produces a flux of $2.5 \times 10^{-4}$ weber in the coil. Determine the self-inductance of the coil.

8. A long solenoid with a cross section $10^{-6}$ m$^2$ has $2 \times 10^5$ turns of wire per meter. What is the inductance per unit length for this solenoid?

9. A coil has self inductance of $4 \times 10^{-3}$ henry and resistance of 4 ohms. What is the power delivered to this coil by an emf which causes a current of $10^{-3}$ amp to increase at .5 amp/s?

10. An inductor is connected to an emf of 50 volts. The coil has an inductance of 4 henrys and its resistance is 10 ohms. Find the energy stored in the magnetic field when a steady current exists in the coil.

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## VOLUME 0 PRE-TEST

| | Answers | | Confidence | | Difficulty Rating |
|---|---|---|---|---|---|
| 1. | | s | | % | |
| 2. | | V | | % | |
| 3. | | A/s | | % | |
| 4. | | A | | % | |
| 5. | | s | | % | |
| 6. | | A | | % | |
| 7. | | H | | % | |
| 8. | | H/m | | % | |
| 9. | | Watts | | % | |
| 10. | | J | | % | |

DIVISIONS 8 & 12

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Physics S211

10 January 1970

VOLUME O POST-TEST

1. Due to a direct current of 1 A in a coil of 300 turns, there exists a flux of $2 \times 10^{-3}$ weber in the coil. Calculate the self-inductance of the coil.

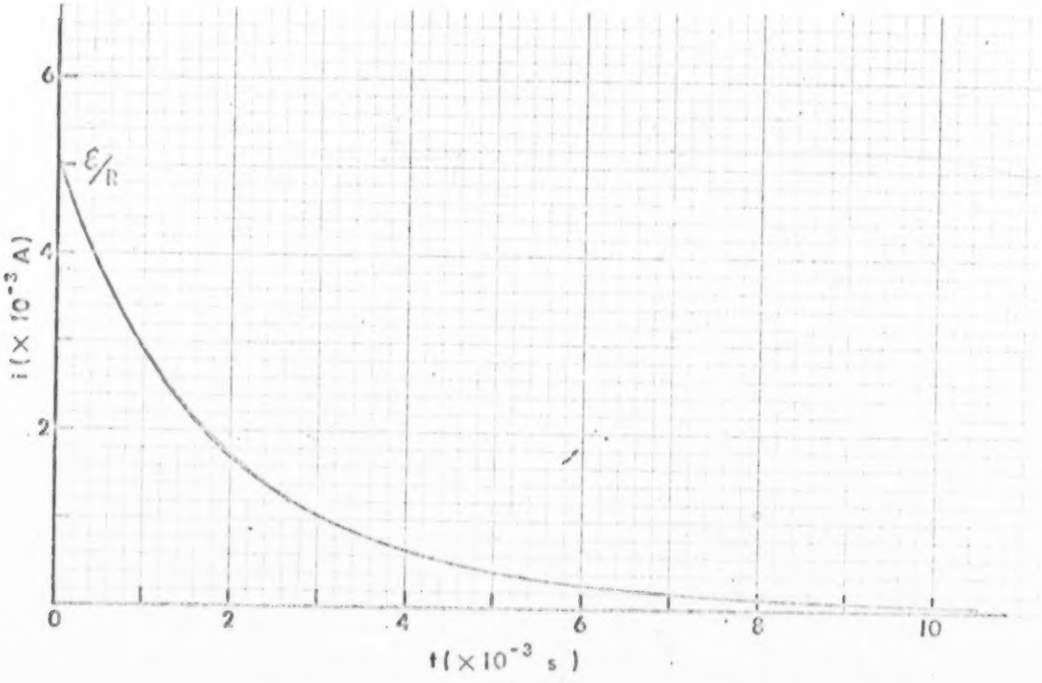
2. A long solenoid with a cross section of $10^{-6}$ $m^2$ has $2 \times 10^4$ turns of wire per meter. What is the inductance per unit length for this solenoid?

3. A coil has a self inductance of $2 \times 10^{-2}$ henrys and resistance of 4 ohms. Find the instantaneous power delivered to this coil by an emf which causes a current of $10^{-3}$ A to increase at the rate of 0.6 A/s.

4. A steady current is found to exist in a coil which is connected to an emf of 22 volts. The coil has an inductance of 2 henrys and a resistance of 11 ohms. What is the energy stored in the magnetic field?

5. Find the charge which accumulates on a capacitor ($C = 10^{-2}$ F) in an RC curcuit due to a 200 volt emf one time constant after the voltage is applied.

6. Find the value of the charging current at one time constant, from the $i$ versus t curve of an RC circuit given below.

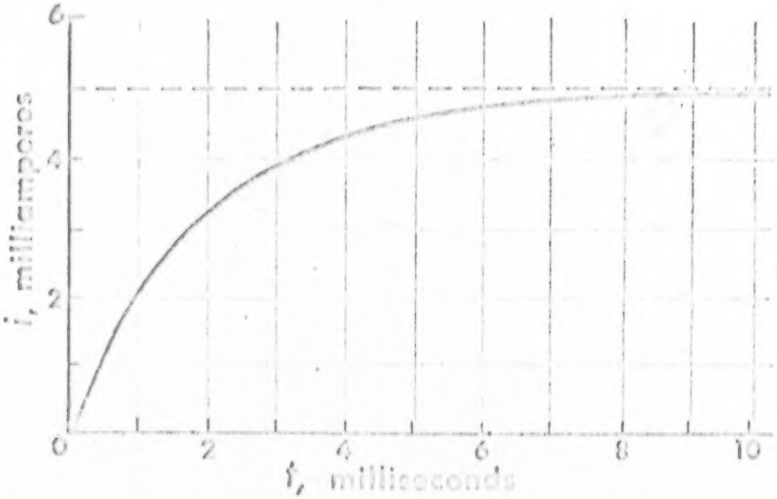


Name ______________________ VOLUME O POST-TEST

7. A capacitor in an RC circuit has been charged at 200 volts. The resistance is 10 ohms. Find the magnitude of current in this circuit at the moment the capacitor begins discharging.

8. A coil with resistance of 15 ohms and inductance of 0.6 henry is connected to a 240 volt D.C. line. At what rate will the current in the coil be rising at the instant the current reaches 80% of its maximum value?

9. The curve given below shows the current versus time in an LR circuit. Find the current at two time constants.



10. If the current in an LR circuit decays to 5% of its equilibrium value in 15s, what is the time constant of the circuit?

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Date 10 January 1970

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## VOLUME 0 POST-TEST

| | Answers | | Confidence | | Difficulty Rating |
|---|---|---|---|---|---|
| 1. | ☐ | H | ☐ | % | ☐ |
| 2. | ☐ | H/m | ☐ | % | ☐ |
| 3. | ☐ | W | ☐ | % | ☐ |
| 4. | ☐ | J | ☐ | % | ☐ |
| 5. | ☐ | C | ☐ | % | ☐ |
| 6. | ☐ | A | ☐ | % | ☐ |
| 7. | ☐ | A | ☐ | % | ☐ |
| 8. | ☐ | A/s | ☐ | % | ☐ |
| 9. | ☐ | mA | ☐ | % | ☐ |
| 10. | ☐ | s | ☐ | % | ☐ |

Physics S211 10 January 1970

Division 8 & 12

# ANSWERS

# TO

# VOLUME O POST-TEST

| Question | Terminal Objective | Answer |
|---|---|---|
| 1 | 117 | 0.6 H |
| 2 | 118 | $5 \times 10^{-4}$ H/m |
| 3 | 119 | $1.6 \times 10^{-5}$ W |
| 4 | 120 | 4 J |
| 5 | 121 | 1.26 C |
| 6 | 122 | $1.85 \times 10^{-3}$ A (1.85 mA) |
| 7 | 123 | 20 A |
| 8 | 124 | 80 A/s |
| 9 | 125 | 43 mA |
| 10 | 126 | 5 s |